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PROCEEDINGS

OF THE

Bristol Naturalists' Society

VOLUME XXXI, 1964–1969

EDITED BY A. J. WILLIS AND J. W. COWIE

ASSISTED BY A COMMITTEE

"Rerum cognoscere causas"—Virgil

Authors alone are responsible for the accuracy of their articles

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SOCIETY

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	Stride, W. H. B., L.D.S.	6 Briarwood, Westbury-on-Trym, Bristol
	Stubbs, R. L.	Green Orchard, Compton Greenfield, Easter Compton, nr. Bristol
	Stubbs, Mrs. R. L.	Do.
	Sullivan, Miss J. M.	139 Dovercourt Road, Horfield, Bristol 7
A.	Sutherland, I. H.	12c Kingsdown Parade, Bristol 6
	Swaine, Miss A. K., F.R.S.A.	Pisang Cottage, Station Road, Nailsea, nr. Bristol
	Swanborough, R. E.	24 Highfield Avenue, Hanham, Bristol
	Sweet, G., M.B.O.U.	40 Cornwallis Crescent, Clifton, Bristol 8
	Sweet, Mrs. G.	Do.
A.	Sweet, Miss S.	Do.
	Swift, D.	Grove House, Grove Park, Weston-super-Mare, Somerset
	Sydenham, W. I. J.	230 Overndale Road, Fishponds, Bristol
	Symes, R. G., B.Sc.	58 Seymour Avenue, Bishopston, Bristol 7

Tamplin, Miss D.	13 St. Edward's Rd., Clifton Wood, Bristol 8
Tanner, Miss A.	5 The Paragon, Clifton, Bristol 8
Tasker, L.	46 Apsley Road, Clifton, Bristol 8
Tasker, Mrs. L.	Do.
Taylor, C. J. H.	12 Claremont Avenue, Bishopston, Bristol 7
Taylor, R., A.C.I.S.	16 Stanbridge Road, Downend, Bristol
Taylor, Mrs. R.	Do.
Taylor, S. M., B.Sc., A.M.I.Mech.E.	Glenalan, Station Road, Nailsea, nr. Bristol
Taylor, Mrs. S. M.	Do.
Taylor, Mrs. W. N.	46 Islington Road, Bedminster, Bristol 3
Thearle, R. F.	17 Miles Road, Clifton, Bristol 8
Thearle, Mrs. R. F.	Do.
Thomas, Miss K. M., B.A.	168 Brynland Avenue, Bishopston, Bristol 7

A.	Thomas, P. T.	The Old Vicarage, Winterbourne Down, Bristol
	Thompson, Mrs. M. E.	4 Ferndown Close, Kingsweston, Avonmouth, Bristol
	Thornhill, H. A.	Heddon, 50 Church Lane, Farleigh, Backwell, nr. Bristol
	Trewman, Mrs. V. C. B.	11 Osborne Road, Clifton, Bristol 8
	Tuck, J. H.	White Cottage, Ubley, Somerset
	Tuck, Mrs. J. H.	Do.
	Tuck, Miss M. G.	Do.
H.	Turner, H. W., M.A., F.G.S.	The Cottage, Kensington Place, Clifton, Bristol 8
	Twells, Miss E., B.Sc.	14 Oakfield Road, Clifton, Bristol 8
	Upton, W.	Glen Lynn, St. Saviour's Road, Larkhall, Bath, Somerset
	Vance, Mrs. R. D.	The Post Office, Nailsea, nr. Bristol
	Varley, Mrs. N. E.	43 Filton Avenue, Horfield, Bristol 7
	Vernon, J. D. R., B.Sc., M.B.O.U.	22 St. David's Road, Thornbury, nr. Bristol
	*Vernon, W. F.	Wyngarth, Easter Compton, nr. Bristol
	Vickery, Miss P. M.	20 Dundonald Road, Redland, Bristol 6
	Vine, Miss D. J., N.F.F.	64 The Crescent, Henleaze, Bristol
	Vinnicombe, Miss E. J., B.Sc., M.A.	32 Ridgeway Road, Long Ashton, Bristol
	Volans, J. F.	19 Thicket Road, Fishponds, Bristol
	Vowles, D. G., B.Sc.(Econ.)	2 York Avenue, Ashley Down, Bristol 7
	Wagner, M. A.	Shepperdine House, Thornbury, nr. Bristol
	Wakefield, Mrs. G. S.	2 Southwood Ave., Coombe Dingle, Bristol 9
	Wallington, W. A.	Bregar, Station Road, Nailsea, nr. Bristol
	Wallington, Miss J.	Do.
H.	*Wallis, Dr. F. S., D.Sc., Ph.D., F.G.S.	5 High Green, Easton, nr. Wells, Somerset
A.	Walton, C. G.	22 Reedley Road, Westbury-on-Trym, Bristol 9
	Warden, D., B.V.M.S.	Centaur, Ham Lane, Bishop Sutton, nr. Bristol
	Warden, Mrs. D.	Do.
	Wareham, Miss C. A. L.	Corscombe, 74 Church Lane, Backwell, nr. Bristol
	Wareham, Miss F. H. E.	Do.
	Watkins, N. A., M.A., F.R.E.S.	18 Old Sneed Park, Stoke Bishop, Bristol 9
C.	Webb, A. E.	Newport House, Newport, Berkeley, Glos.
C.	Webb, Mrs. A. E.	Do.
	Webb, N. R., B.Sc.	45 Egerton Road, Bishopston, Bristol 7
	Webb, S. R.	36 Frome Valley Road, Stapleton, Bristol
	Webber, Miss N. D.	Manor Cottage, Chew Magna, nr. Bristol
	Weber, Miss J. M.	31 Shirehampton Road, Stoke Bishop, Bristol 9
C.	Weeks, A. H.	4 Shepherds Way, Rickmansworth, Herts.
	Weir, Mrs. A. M.	Hursley Hill, Whitchurch, Bristol
C.	Welch, Dr. F. B. A., B.Sc., Ph.D.	Penyllan, Gadshill Road, Charlton Kings, Cheltenham, Glos.
	Welshman, Miss M. J.	2 King's Road, Brislington, Bristol 4
	West, Miss N. L.	18 Dennyview Rd., Abbots Leigh, nr. Bristol
	Westcott, Miss M. V., M.Sc.	20 Linden Road, Redland, Bristol 6
	Whatley, D.	43 Radley Road, Fishponds, Bristol

Whistler, L. D.	8 Dundonald Road, Redland, Bristol 6
White, D. S., B.Sc.	44 The Park, Kingswood, Bristol
Whiting, Dr. H. P., D.S.C., M.A., Ph.D.	62 Woodstock Road, Redland, Bristol 6
*Whittard, Prof. W. F., D.Sc., Ph.D., F.R.S.	Dept. of Geology, University of Bristol, Bristol 8
Williams, Mrs. G. E.	14 de Maulley Road, Canford Cliffs, Poole, Dorset
Williams, Mrs. M. B.	Braeside, 10 Pine Hill, Weston-super-Mare, Somerset
Williams, R. G.	36 Strathmore Road, Horfield, Bristol 7
Williams, T. R. J., M.Sc., A.R.I.C.	39 Orchard Road, Nailsea, nr. Bristol
Williams, Mrs. T. R. J.	Do.
*Willis, Dr. A. J., B.Sc., Ph.D., F.L.S.	Dept. of Botany, University of Bristol, Bristol 8
Wills, R. F.	40 Claremont Road, Bishopston, Bristol 7
Wills, Mrs. R. F.	Do.
A. Wilson, Miss P. E.	Clifton Hill House, Clifton, Bristol 8
Winchester, Miss A., B.A.	12 Wellington Terrace, Clifton, Bristol 8
Winchester, Miss D. E.	33 Hampton Park, Redland, Bristol 6
Winter, Miss B.	151 West Town Lane, Bristol 4
Withers, Miss D.	81 Stroud Road, Gloucester
Woodland, P., M.A.	Dursley Grammar School, Dursley, Glos.
Yemm, Prof. E. W., B.A., D.Phil., F.L.S.	Stoneleigh, Long Ashton, Bristol
Yemm, Mrs. E. W., B.A.	Do.
H. *Yonge, Prof. C. M., C.B.E., Ph.D., D.Sc., F.R.S., F.R.S.E.	Dept. of Zoology, The University, Glasgow

Affiliated Societies

BATH—

Bath Natural History Society (Hon. Secretary, F. R. Sterne), 9 Charlcombe Way, Bath, Somerset

Newton Park Naturalists' Society, Newton Park College, Newton St. Loe, nr. Bath, Somerset

BRISTOL—

Bedminster Down School, Donald Road, Bristol 3

Bristol, Clifton and West of England Zoological Society, Clifton, Bristol 8

Bristol Grammar School Field Club, Elton Road, Bristol 8

Clifton High School Field Club, College Road, Bristol 8

College of St. Matthias, Fishponds, Bristol

Red Maids Scientific Society, Westbury-on-Trym, Bristol

Redland High School for Girls Field Club, Redland Court, Bristol 6

Trafalgar Social Club, Imperial Chemical Industries Ltd., 35 Queen Square, Bristol 1

University of Bristol Animal Welfare Society, Dept. of Veterinary Science, University of Bristol, Park Row, Bristol 1

University of Bristol Geological Society, Queen's Building, University Walk, Bristol 8

University of Bristol Zoological and Botanical Societies, The University, Bristol 8

DURSLEY—

Dursley & District Bird Watching and Preservation Society (Hon. Secretary, T. P. Walsh), 76 Kingshill Road, Dursley, Glos.

Dursley Grammar School Natural History Society, Dursley, Glos.

KINGSWOOD—

Kingswood Grammar School Natural History Society, Kingswood, nr. Bristol

REPORT OF COUNCIL
1964

THE membership is now 660, including 58 juniors. There are 16 affiliated societies.

At the Annual General Meeting the Officers and Members of Council were elected with Dr. R. J. G. Savage as president. The usual General and Sectional meetings were held and the Field meetings continue to provide popular, varied and instructive programmes. The new layout of the monthly bulletins has been well received. The Annual Dinner was held on 20 March in the Senior Common Room of the University and was again voted a great success.

We regret to have to announce the deaths of J. Parfitt and F. P. Phillips.

GWYNNETH STERNE, *Hon. Secretary.*

REPORT OF ENTOMOLOGICAL SECTION
1964

THE 100th Annual Business Meeting was held on 21 January, 1964, when the following were elected : President, Mr. P. F. Bird; Secretary, Dr. D. A. Stopher; Committee: Mrs. A. J. Hollowell, Messrs. K. H. Poole, C. S. H. Blathwayt, D. G. Gibb and N. A. Watkins. After the meeting, the City Museum's entomological collections were inspected.

During 1964 the following meetings were held:

Feb. 18 : Insect Pests of Farms and Gardens, by Mr. J. D. R. Vernon.

Mar. 9 : Bees and Flowers, by Dr. M. S. Percival; joint meeting with Botanical Section.

Oct. 20 : Mimicry in Butterflies, by Mr. R. W. J. Henderson.

Nov. 17 : Members' Exhibits.

The Field Meeting was cancelled because of rain.

D. A. STOPHER, *Hon. Secretary.*

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31 DECEMBER 1964

Dr.

1963 £ s. d.			£ s. d.	£ s. d.	£ s. d.
	To Members' Subscriptions:				
519 6 11	Full Members	1963	3 15 0		
		1964	510 0 6		
		1965	19 15 0	533 10 6	
50 13 6	,, ,, of the same household	1963	1 5 0		
		1964	49 7 6		
		1965	1 17 6	52 10 0	
17 10 0	Corresponding Members	1964	15 0 0		
		1965	12 6	15 12 6	
12 10 0	Associates	1963	10 0		
		1964	14 0 0		
		1965	2 10 0	17 0 0	
11 5 0	Juniors	1964	13 0 0	13 0 0	
26 10 0	Affiliated Societies	1964	24 0 0	24 0 0	655 13 0
637 15 5					
	,, *Proceedings* (1962 and 1963):				
	Grants, authors' contributions		11 0 0		
	Separates		23 10 3		
	Subscribers		4 2 9		
40 11 4	,, Sales of Publications		32 16 6		71 9 6
					727 2 6
– – –	,, Field Committee: surplus over expenses				6 3 8
5 13 6	,, Sales of Badges				1 15 9
– – –	,, Profit on Dinner				1 17 0
2 18 1	,, National Nature Week Committee: net profit				– – –
65 11 6	,, Members' contribution to the University Appeal				– – –
2 19 0	,, Interest on deposit in Post Office Savings Bank				3 0 6
10 0 0	,, ,, ,, Defence Bonds and National Development Bonds				14 15 4
765 8 10					754 14 9
449 1 9	,, Balance from last account				538 5 4
£1,214 10 7					£1,293 0 1

P. J. M. NETHERCOTT, *Hon. Treasurer*,
12 January, 1965

Cr.

1963 £ s. d.		£ s. d.	£ s. d.
82 12 3	By General Printing and Stationery	108 6 9	
85 10 9	,, Postages and telephone	88 10 7	
15 0	,, Cheque books	15 0	
12 0 0	,, Clerical assistance	12 0 0	209 12 4
180 18 0			
268 2 2	,, *Proceedings* (1963, including separates)		313 2 8
8 7 0	,, Books	15 5 6	
20 16 0	,, Bookbinding	– – –	
26 10 6	,, Periodicals	23 16 6	
1 0	,, Rent (of library room)	1 0	
4 10 9	,, Fire insurance (library)	4 10 9	43 13 9
	,, Subscriptions:		
2 10 0	Council for Nature etc.	2 10 0	
3 5 0	South Western Naturalists' Union	3 4 0	5 14 0
13 5 0	,, Fares and expenses of general meetings		8 11 0
3 3 0	,, Loss on dinner		– – –
5 16 10	,, Field Committee: excess expenditure		
64 0 0	,, Grants to Sections:		
	Botanical	12 0 0	
	Entomological	10 0 0	
	Geological	15 0 0	
	Ornithological	25 0 0	
	Junior	5 0 0	67 0 0
601 5 3			647 13 9
75 0 0	,, The University Appeal: members' and Society's donation		– – –
	,, Balances to next account:		
– – –	Cash in hands of Hon. Treasurer	3 0	
175 9 11	Cash at Bank	73 3 9	
121 9 3	Deposit in Post Office Savings Bank	124 9 9	
200 0 0	£200 5% Defence Bonds	200 0 0	
	£200 5% National Development Bonds purchased	200 0 0	
41 6 2	In hands of Field Committee	47 9 10	645 6 4
£1,214 10 7			£1,293 0 1

Audited and found correct,
A. E. BILLETT, *Hon. Auditor*,
19 January, 1965

REPORT OF BOTANICAL SECTION

1964

At the Annual Business Meeting held in the Botany Lecture Theatre of the University on 13 January, 1964, the following officers were elected: President, Mr. I. W. Evans ; Secretary and Treasurer, Miss I. F. Gravestock ; Committee : Mrs. C. H. Cummins, Dr. A. F. Devonshire, Mr. J. A. Eatough, Dr. R. M. Harley, Mrs. I. C. I. Milton, Mr. P. J. M. Nethercott and Miss A. M. Sampson.

The Wild Plant table at the Bristol Museum has been much appreciated during the year and sincere thanks are offered to Mr. A. Warhurst and Mr. P. F. Bird of the Museum, and to Mr. I. W. Evans, Mrs. G. S. Wakefield and Mrs. C. H. Cummins as well as to all members who have contributed specimens.

The following Winter Meetings were held during the year :

Jan. 13 : Annual Business Meeting, followed by Members' Evening.

Feb. 10 : A Mapping Scheme for the Higher Fungi, by Dr. T. E. T. Bond, who described the scheme relating to certain species as inaugurated at an International Conference in Prague in 1960.

Mar. 9 : Bees and Flowers, by Dr. M. S. Percival. Joint meeting with Entomological Section.

Oct. 12 : Introduction to the Fungi of Hanham Wood, by Dr. C. E. D. Smith. This talk was introductory to the field meeting on Oct.17.

Nov. 9 : Members' Evening, with transparencies.

The following field excursions took place, under the leadership of those shown :

Feb. 29 : Westonbirt Arboretum. Mr. P. J. M. Nethercott.

Apr. 20 : Bank of the Avon. Miss A. M. Sampson.

May 9 : Dawlish Warren. Mr. I. W. Evans and Mr. J. A. Eatough.

May 27 : Dundry. Mr. I. W. Evans.
A visit to Mr. L. Ogilvie's garden.

June 9 : Frampton Cotterell and Iron Acton. Mr. I. W. Evans.

June 20 : Whitchurch to Keynsham. Mr. I. W. Evans.

July 11 : Leckhampton Hill and Badgeworth. Mrs. S. C. Holland, North Gloucestershire Naturalists' Society. The limestone flora of Leckhampton Hill, including *Herminium monorchis* was seen ; at the Badgeworth Nature Reserve spring-germinated plants of *Ranunculus ophioglossifolius* were in full flower and the main crop had grown well.

July 18 : Michael Wood, nr. Stone. Dr. A. F. Devonshire.

Aug. 15 : Chelvey and Backwell. Mr. I. W. Evans and Mr. C. H. Cummins. Mr. P. J. Abrams, Superintendent of Parks and Gardens, Bristol, showed his garden at the lodge of Backwell Hill House. The walk continued to Goblin Combe and Cleeve Hill.

Sept. 5 : Centenary Walk : Glen Frome to Frenchay. Dr. A. F. Devonshire and Mr. I. W. Evans. The walk followed the route covered 100 years ago by the Botanical Section at its first field meeting.

Oct. 17 : Fungus foray to Hanham Wood. Dr. C. E. D. Smith. At least 40 species of fungi were identified, including *Geastrum triplex* and *Lepiota rhacodes*. *Armillaria mellea* and *Coprinus disseminatus* were also present in profusion.

I. F. GRAVESTOCK, *Hon. Secretary.*

REPORT OF GEOLOGICAL SECTION
1964

THE Annual Business Meeting was held in the Geology Department of the University on 16 January, 1964, when the following officers were elected: President, Mr. R. Bradshaw; Vice-President, Dr. J. W. Cowie; Hon. Secretary, Miss M. A. Smith; Field Secretary, Mr. A. C. K. Fear; Committee, Prof. W. F. Whittard and the Student President of the University Geological Society (*ex-officio*), Mr. T. R. Fry, Mr. R. G. Payne, Prof. F. C. Phillips, Dr. R. J. G. Savage, Mr. W. Stock, Mr. D. Vowles, Mr. F. S. Ross, Mr. M. D. Kamm.

During 1964 the committee met twice—on 15 January to make proposals for officers and on 22 January to arrange summer and winter programmes. At the Annual General Meeting geological films were shown. In addition there were three lecture meetings of the section during the year:

Feb. 20: Dr. J. W. Murray: The Ecology of Foraminiferids.
Mar. 19: Dr. M. K. Wells: Geology of the Freetown District, Sierra Leone.
Nov. 19: Dr. R. W. R. Rutland: Chile.

There were three Field Meetings as follows:

May 2: Buckover: leader Dr. M. L. K. Curtis.
June 21: Purton, Swindon and Langton Burrell; leaders Messrs. A. E. Prismall and F. S. Ross.
July 25: Portishead: leader Mr. S. C. Matthews.

All lectures were held in the Geology Department of the University, and once more we would like to record our thanks to Professor Whittard for making the premises freely available for these activities.

MARGARET A. SMITH, *Hon. Secretary.*

HON. LIBRARIAN'S REPORT
1964

THE room in the City Museum in which the library is housed has been cleaned and redecorated. The Society is indebted to the Director of the Museum, Mr. A. Warhurst, who arranged for this to be done, and to members of his staff who rendered assistance. Thanks are due also to members of the Society who helped with the dusting and transporting of books.

A major reorganization of the library has been initiated and it is hoped that when this is finished more members of the Society will visit the library to make use of the fairly extensive facilities available.

Several new books were purchased during the year. 99 books and periodicals were borrowed by 30 members.

R. BRADSHAW, *Hon. Librarian.*

REPORT OF ORNITHOLOGICAL SECTION

1964

"THE WREN THE WREN
THE KING OF ALL BIRDS..."

AT the 40th Annual Business Meeting in January, Mr. Hugh Boyd was re-elected President and Mr. S. M. Taylor Hon. Secretary. Mr. M. Kendall and Mr. G. Sweet were elected to the Committee in place of Miss R. C. Lee and Mr. R. M. Curber, who retired by seniority.

During 1964, the Section held seven indoor meetings, at which the attendance averaged 86, the maximum being 110 and the minimum (as usual, for the Fieldwork Meeting) 43. The speakers and their subjects were :

Jan. 17 : Annual Business Meeting. Mr. C. J. Sellick—In search of Geese.
Feb. 12 : Mr. Tony Cook—Borough Fen Decoy and its Birds.
Mar. 6 : Annual Fieldwork Meeting.
Mar. 25 : Mr. E. L. Roberts—Caerlaverock National Nature Reserve.
Oct. 14 : Mr. H. Boyd—Recent work on Ducks in the Bristol District.
Nov. 20 : Joint meeting with the British Trust for Ornithology ; Mr. Peter Davis—Recent Research on Bird Migration.
Dec. 11 : Mr. John Burton—Recording Birdsong in Holland, 1963.

Afternoon or evening field walks were held in the Spring to Newton Park, Bath ; Leigh Woods; Kenn Moor; and Frampton-on-Severn Gravel Pits. The leaders were Messrs. B. King, P. J. Chadwick, H. R. Hammacott and A. E. Billett respectively.

The programme of co-operative fieldwork was probably more extensive than ever before. It included a continuation of the breeding-season survey of Shelduck on the coast between Bristol and Weston, which revealed a continuation of the decline in numbers of adults and of ducklings observed in 1963. An aerial survey of the estuary by Mr. Boyd confirmed these findings, which are in contrast to experience in other parts of the country. A pilot scheme for studying roosts reported by members was started under the care of Mr. Thearle, and a study of the distribution of birds of prey was organized by Mr. Sweet. This latter was exceptionally well supported, and has given for the first time some quantitative information to back up the subjective judgment which was all that was available hitherto. The results were used as part of the national enquiry on Small Predators being run by the B.T.O. and the Nature Conservancy.

A breeding-season survey of waters for Great Crested Grebes was organized by Mr. B. King. This was a pilot operation for a national survey to be made by the B.T.O. in 1965. Other B.T.O. enquiries supported by members were the Nest Record and Ringing Schemes, and the Common Bird Census.

We are indebted to all who participated in this work, and especially to those junior members who contributed regularly. The level of support for the whole programme promises well for the future.

S. M. TAYLOR, *Hon. Secretary.*

ACCOUNT OF THE GENERAL MEETINGS
1964

THE meetings have been very well attended even to the point of consideration having been given to the need for larger accommodation.

The 101st Annual General Meeting was held on 23 January, the Officers and Members of Council for 1964 then being elected with Dr. R. J. G. Savage as president. Mr. H. H. Davis was made an honorary member. The President thanked the retiring Secretary, Mr. A. C. Leach, for his patient and devoted services to the Society for many years as a member and the past five as secretary. Dr. Savage then gave an address on "Whence our pets? Some reflections on the origins of domestication." This most enlightening talk traced the evolution of domestic animals from prehistoric times to the present and was illustrated by slides of cave paintings and of living animals.

On 6 Feb. Dr. G. V. T. Matthews spoke on "Sense and Nonsense in Bird Orientation." He concluded that birds were influenced by the sun by day and the constellation patterns at night as aids to navigation.

On 5 Mar. Dr. H. P. Whiting gave a talk on " Lampreys ". He differentiated the three types : brook, river and sea lampreys ; and described their varied lives. Besides illustrating his lecture with slides, Dr. Whiting showed live specimens.

On 1 Oct. the winter session was opened by the return visit of Dr. E. G. Neal who brought us up to date with information and thought on the " Breeding Cycle in Badgers and associated behaviour".

On 5 Nov. Prof. F. H. T. Rhodes from University College, Swansea, gave a lively and full talk on " Australia—the Isolated Continent" and with maps of geological times showed the isolation to have been so complete so long ago as to be the cause of the unique evolution of the life now indigenous.

On 3 Dec. Mr. B. W. Cunliffe of Bristol University lectured on " Modern Techniques in Archaeology " and the place of natural sciences in archaeology. A comparatively young science having its roots in the 18th century, scientific archaeology has advanced to the point where today we are in the midst of scientific revolution. Use is now made of such diverse procedures as aerial photography, proton magnetometry, radiometric dating techniques with C^{14} and potassium/argon ratios, and pollen analysis. Study of bone fragments may throw some light on the food sources of Iron-age man.

GWYNNETH STERNE, *Hon. Secretary.*

GENERAL FIELD MEETINGS

FIFTEEN field meetings were held during the year as well as two informal walks and were generally well attended. On the whole the attendance was greater at the winter meetings than the summer ones. The Social Evening was as usual very successful.

A list of the meetings, with dates, places visited, and leaders is given below; a more complete account is kept in the records of the Field Committee.

Jan. 12 : Brean Down. Numbers of duck and stonechat were seen, also two black redstarts and an avocet. Mr. H. G. Hockey.

Feb. 16 : Frampton Ponds (flooded gravel pits), near Frampton-on-Severn; Hock Cliff (on the Severn Bank). Mr. J. D. R. Vernon and Mr. D. A. C. Cullen.

Feb. 28 : Social Evening. An illustrated talk, *Wanderings in Wales*, by Mr. J. A. Eatough.

Mar. 27 : Malvern. The British Camp, the reservoir, and Worcestershire Beacon were visited. Mr. and Mrs. H. G. Hockey.

April 18 : Walton Hill (near Street) to Nythe. Loxley woods. Mr. H. F. Flook.

April 29 : Bank of the Avon near Portbury. Miss C. Groves.

May 3 : Hengistbury Head, Christchurch. Here waders, including a whimbrel, terns, old iron ore workings, and an Iron Age Fort were seen. Mr. H. G. Hockey and Mr. B. King.

May 13 : Woods near Hanham and River Avon. Mr. D. A. C. Cullen.

June 3 : Mendip ; the Forestry Commission Nurseries. Mrs. V. J. Pitt.

June 7 : Forest of Dean. Tidenham Chase, Nagshead enclosure, Cannop ponds, and Speech House. Amongst the birds seen were a nightjar and pied flycatchers. *Euphorbia stricta* was plentiful at one spot. Mr. C. Ellis and Mr. D. A. C. Cullen.

June 15 : Sand Bay and Sand Point near Weston-super-Mare. Mr. H. G. Hockey.

July 5 : Hambledon Hill (near Sturminster Newton): an Iron Age Hill Fort and Neolithic Camp. Wingreen Hill (near Shaftesbury). Chalk flora seen at both sites. Mrs. G. H. Dudden and Dr. A. F. Devonshire.

July 26 : Wrington Hill. An informal walk. Mr. H. G. Hockey.

Aug. 23 : Wavering Down. An informal walk. Mr. H. G. Hockey.

Sept. 19 : Avebury, Silbury Hill, West Kennet Long Barrow, and Woodhenge. Mr. A. C. K. Fear.

Sept. 26 : Barry docks, by steamer. Birds seen included cormorants, common terns, and a kingfisher. Mr. H. G. Hockey.

Oct. 11 : Quantocks. Lilstock to Kilve along the beach, for ducks and waders. Holford Combe for fungi. Mr. H. G. Hockey.

Nov. 29 : The Huntspill river, where a black redstart was seen. Tealham Moor. Mr. D. A. C. Cullen.

A. F. DEVONSHIRE, *Hon. Field Secretary.*

ACKNOWLEDGMENT

Thanks are due to the British Broadcasting Corporation for a grant towards the cost of publication of original papers in this issue of the PROCEEDINGS.

BRISTOL BOTANY IN 1964

By the late N. Y. Sandwith

THE winter months of 1964 were quite mild and dry. They were succeeded in March by an early and bitterly cold Easter, but an unusually fine May was followed by the best summer we have enjoyed for several years, and the good weather continued, on the whole, until the storms of early December and the cold and snow of the Christmas season.

The botanical notes this year include a large number of aliens and garden escapes found in a more or less naturalized state, and some of them seem hardly worth putting on record, especially when they are so close to human habitations. Meanwhile, the deterioration, or even the destruction, of natural habitats such as marshes and bogs grows apace. In particular, our Somerset peat moors are gravely threatened. They have been gradually drying up for a number of years, but now they are suffering from rapid exploitation for horticultural peat by means of modern machinery. Small-holders are tempted to sell their land or to cut it themselves; or else they allow some areas to revert to impenetrable carr. Some of us, with the active help of the Nature Conservancy and the newly inaugurated Somerset County Trust for Nature Conservation, are trying to save three or four of the best remaining sites but, even so, the influence of adjacent cutting will present a further problem.

Names of contributors of more than one record are abbreviated, thus :—

I.W.E., I. W. Evans
G.W.G., G. W. Garlick
R.M.H., Dr. R. M. Harley
I.F.G., Miss I. F. Gravestock
S.C.H., Mrs. S. C. Holland
R.G.B.R., Capt. R. G. B. Roe, R.N.
P.J.M.N., P. J. M. Nethercott
D.M.S., Dr. D. Munro Smith
A.J.W., Dr. A. J. Willis
N.Y.S., N. Y. Sandwith
G.S.W., Mrs. G. S. Wakefield
I.M.R., Miss I. M. Roper (decd.)

Ranunculus bulbosus L. Several male-sterile plants with very narrow leaf-segments and bases of petioles blotched purplish black, Durdham Down (Downleaze), **G.**, *R.M.H.*

Aquilegia vulgaris L. Rose Wood, Axbridge, **S.**, *P.J.M.N.*

Papaver Lecoqii Lamotte. Car park, University Road, Bristol, **G.**, *R.M.H.*

Fumaria muralis Sonder, ssp. *Boraei* (Jord.) Pugsl. Leap Bridge, Downend, **G.**, 1956, *G.W.G.*, and in waste ground at Downend (some with white flowers), 1959–1964, *D.M.S.* By the Ridge School, Yate, **G.**, 1956, *G.W.G.*

F. densiflora DC. Waste ground by a new road running from Downend towards Moorend; and an allotment ground near Oldbury Court, **G.**, *D.M.S.*, who sent me material for verification. This is a most welcome reappearance of a species hitherto recorded only from a hedge at Downend in June, 1855, *Herb. J. H. Cundall*, and as a casual at Bedminster, **S.**, in 1922, see *Adventive Flora of Port of Bristol.*

Sagina ciliata Fr. Sea-wall between Sheperdine and Oldbury-on-Severn, **G.**, *S.C.H.*

Helianthemum Chamaecistus Mill. A few plants with pale cream-coloured flowers on Wavering Down, **S.**, *P.J.M.N.* With "white" flowers, Callow Rocks, **S.**, 1913, *I.M.R.*, ms. in her interleaved copy of White's Flora.

Geranium purpureum Vill. A vigorous clump at Sea Walls, Durdham Down, **G.**, *R.M.H.*, conft. *A.J.W.*

Rosa pimpinellifolia L. A number of bushes on high cliffs on the S.E. side of Cheddar Gorge, **S.**, 1963–1964, *P.J.M.N.* and *A.J.W.*

R. arvensis Huds. × *canina* L. Roadside, Mangotsfield, **G.**, *D.M.S.*, det. *R. Melville.*

R. agrestis Savi × *stylosa* Desv. The sweet briar roses growing on part of Sand Point, **S.**, were examined on August 18th 1954. They would be classified in Wolley-Dod's scheme as forms of *R. agrestis* and most of the bushes would be assigned to his var. *belnensis* (Ozan.) Rouy [see "Bristol Botany in 1926", where var. *belnensis* is recorded from Sand Point, the Cadbury Ridge and Uphill, **S.**]. These plants have rather long peduncles, up to 2.5 cm., with globular or subglobular hips. The styles are long-exserted and often agglutinated. Many of the leaflets are rounded at the base instead of cuneate, as in typical *R. agrestis*, and they are also broader and more or less elliptic. They are pubescent beneath and have scattered glands which are often smaller than in *R. agrestis*. The marginal serrature is somewhat blunter and generally less complex, there being mostly 2 or 3 secondary gland-tipped teeth on each major tooth, instead of 3 to 4 or more, and the marginal glands also are smaller than in typical *R. agrestis*. These characters are consistent with the plants being hybrids between *R. agrestis* and *R. stylosa* Desv. which, as var. *systyla* (Bast.) Baker, is a common and widespread rose in Somerset.—*R. Melville.*

Sorbus torminalis (L.) Cr. Rose Wood, Axbridge, **S.**, *P.J.M.N.*

Sedum album L. A small quantity in a quarry, Leigh Woods, **S.**, probably of recent introduction, *P.J.M.N.*

Myriophyllum spicatum L. Pond in deserted sandstone quarry, Kingswood, Bristol, **G.**, *D.M.S.*

Œnanthe pimpinelloides L. In abundance, Stockwood Vale, **S.**, *I.W.E.*

Heracleum Sphondylium L. var. *angustifolium* Huds. By the By Brook, Bathford, **S.**, *Miss Janet Robinson.* A striking variety, or rather form, as it usually occurs as an isolated individual, for which I have no less than 8 ms. records apart from those given in *White, Fl.*

Valerianella carinata Lois. Wall, Downleaze, **G.**, *R.M.H.*; and in College Fields, Clifton, **G.**, *N.Y.S.*

Artemisia Absinthium L. Waste ground, Bovey Hill, Moorend, **G.**, *D.M.S.*

Senecio Jacobaea L. A sport with all the heads entirely converted into green, bract-like organs, without any normal florets, occurred on a grassy wayside at Downend, **G.**, *D.M.S.*

Cichorium Intybus L. Hill above Monkton Combe, **S.**, in quantity, *I.F.G.*

Campanula latifolia L. One plant with white flowers in Oldbury Court Woods, Stapleton, **G.**, *D.M.S.*, who also reports this species from Cleeve Wood, Frenchay, **G.**

Gentianella Amarella (L.) H. Sm. On high scree of Goblin Combe, **S.**, *Mrs. C. H. Cummins.*

Echium vulgare L. Cadbury Camp, Clevedon, **S.**, *I.M.R.*, ms., and still there, *D. J. Hewitt* (comm. *P. F. Bird*).

Chaenorrhinum minus (L.) Lge. Old railway track, Monkton Combe, **S.**, *I.F.G.*

Mentha × *piperita* L. Clandown Bottom, Paulton, **S.**, *R.G.B.R.*, who also records the forma *hirsuta* (Fraser) R. A. Graham from Tucking Mill, Compton Dando, **S.** This hairy form is the plant formerly referred to *M. pubescens* (*M. aquatica* × *longifolia*) from the bank of the Chew at Compton Dando, see "Bristol Botany in 1923".

M. × *Smithiana* R. A. Graham. (*M. rubra* Sm.). By the Weir, Moorend, **G.**, 1959, *D.M.S.*, an example with hairy calyces and exserted stamens. This hairy form is unique in the experience of Dr. Harley, who named or confirmed all the Mints mentioned in these notes. Clandown Bottom, Paulton, **S.**, *R.G.B.R.*

M. × *cordifolia* Opiz. (*M. rotundifolia* (L.) Huds. × *spicata* L.). Waste ground, Downend, **G.**, *D.M.S.* A first record for the Gloucestershire side of the district.

Stachys × *ambigua* Sm. Soil heap at Easton-in-Gordano, **S.**, *R.M.H.*

Chenopodium polyspermum L. In quantity, introduced in the building of the Oldbury Atomic Power Station, **G.**, *S.C.H.*

C. ficifolium Sm. Soil heap at Easton-in-Gordano, **S.**, *R.M.H.*

Neottia nidus-avis L. A single plant in Leigh Woods, **S.**, *P.J.M.N.* Mr. White apparently never saw it here, citing only the old records of T. B. Flower and Swete's Flora, 1840 and 1849, and I have no more recent note.

Orchis ericetorum (E. F. Linton) E. S. Marshall. Railway embankment, Coalpit Heath, **G.**, *D.M.S.* A rather strange habitat for this species, but the specimen was correctly named.

Scirpus caespitosus L. Mr. White (*Flora*, p. 619) regarded this species as "well distributed on the drier parts of the peat moors", **S.** I doubt if this was so, even 50 years ago, and to-day *S. caespitosus* is so rare on the peat moors that I know of only a few tufts in boggy ground on Westhay Moor.

Carex strigosa Huds. Cleeve Wood, Frenchay, **G.**, *D.M.S.*

C. humilis Leyss. South-west slope of Crook Peak, **S.**, in an area of about 15 by 20 yards, partly in *Festuca* turf and partly on the edges of limestone outcrops. Discovered in April, after a deliberate search, by *P.J.M.N.*

C. digitata L. Two good tufts bordering Clifton Down, **G.** (apparently a new station), and a fifth locality in Leigh Woods, **S.**, *P.J.M.N.*

Koeleria vallesiana (Honck.) Bertol. A fair quantity on Axbridge Hill, and a very little on Fry's Hill, **S.**, *P.J.M.N.*, who failed to find it on Callow Hill and thinks that Fry's Hill may mark the easternmost limit of this species.

Polystichum setiferum (Forsk.) Woynar. (*P. angulare* Presl). Clifton Down, **G.**, 2 roots, *P.J.M.N.* Not noted from the Downs by White, but there is a record, " Durdham Down, *Hb. Cicr. Coll.*", in *Fl. Glos.*, p. 597.

ALIENS. *Sisymbrium septulatum* DC. Some fine plants in Avonmouth Dock, **G.**, *N.Y.S.* This was the only species of interest noted in the sadly cleaned-up Dock area.

Pachyphragma macrophyllum (Hoffm.) N. Busch. (*Thlaspi latifolium* M.B.). A well-established colony at edge of a wood, Belmont, near Flax Bourton, **S.**, *Dr. J. H. Davie*, det. *A.J.W.* This is a native of the Caucasus and N.E. Asia Minor, remarkable for its large round leaves heart-shaped at the base, and its large white flowers and fruits. It is frequently grown in gardens.

Erodium Manescavii Coss. A few well-established plants on a roadside verge far from houses N.E. of Wookey, **S.**, *E. Milne-Redhead.* This large-flowered species with rich magenta petals, well known in gardens, is endemic in the Pyrenees.

× *Crataegomespilus grandiflorus* (Sm.) Bean. A tree of this bigeneric hybrid in Goblin Combe, Cleeve, **S.**, *Dr. J. E. Fraymouth* and *Dr. L. E. Hawker.* A presumed natural hybrid of the Medlar and Hawthorn (*Crataegus monogyna*), found wild in France and long known in cultivation in Britain, see *B.E.C. 1946–47 Rep.*, vol. 13 (3), p. 260 (1948).

Saxifraga hirsuta L. × *spathularis* Brot. Earthy ledge by roadside, Stapleton, **G.**, *M. Norgate*, det. *A.J.W.* and *R.M.H.*

S. Cymbalaria L. var. *Huetiana* (Boiss.) Engl. Bank of R. Trym near a cottage, Combe Dingle, **G.**, *G.S.W.*, conft. *A.J.W.*

Erigeron philadelphicus L. In quantity by pavement, Almondsbury Hill, **G.**, *I.W.E.*, det. *A.J.W.*

Artemisia biennis Willd. Still at Bath, **S.**, 1963, by the river about a mile below the Gasworks (cf. "Bristol Botany in 1925"), *R.G.B.R.*

Centaurea montana L. Roadside, Binegar, **S.**, *I.W.E.*, det. *A.J.W.*

Hieracium brunneocroceum Pugsl. Waste ground, Stapleton, **G.**, *D.M.S.*

Anagallis foemina Mill. Queen Square, Bristol, **G.**, with other weeds, *Dr. A. F. Devonshire.*

Buddleja Davidii Franch. Five bushes established on the lower slopes of Crook Peak, **S.**, *P.J.M.N.*

Hyoscyamus niger L. Many plants on site of plane trees uprooted in gale, Queen Square, Bristol, **G.**, *Miss A. M. Sampson.*

Verbascum Blattaria L. Waste ground, Downend, **G.**, *D.M.S.*

Amaranthus hybridus L. × *retroflexus* L. (*A.* × *Ozanonii* Thell.). Avonmouth Dock, **G.**, Oct. 1959, *N.Y.S.* no. 5738 in Kew Herb., det. *P. Aellen.* New to the adventive list. Mr. J. P. M. Brenan tells me that he has, so far, seen only 4 British gatherings of this hybrid.

A. albus L. Waste ground by the Avon below Bath, **S.**, 1963, *R.G.B.R.*

Rumex scutatus L. The record from Winterbourne Down, **G.** (see "Bristol Botany in 1963") must be deleted. *D.M.S.* writes that the plant was only an unusual form of *R. Acetosella* L.

Ruscus Hypoglossum L. Penpole Point, **G.**, *G.S.W.*, conft. *A.J.W.*

Allium paradoxum (M.B.) G. Don. Roadside verge, Bitton, **G.**, *R.M.H.*

Panicum miliaceum L. Along Portway under the Downs, **G.**, *P.J.M.N.*

BRYOPHYTES. *Grimmia Doniana* Sm. On slag of old lead-workings, Charterhouse-on-Mendip, **S.**, *R.M.H.*, conft. *E. F. Warburg.*

Eucladium verticillatum B. et S. On sandstone rocks in Glen Frome, Stapleton, **G.**, *D.M.S.*, det. *F. A. Sowter.*

Dicranum strictum Schleich. ex Schwaegr. On decaying stump, Leigh Woods, *D.M.S.*, det. *R. D. Fitzgerald*, conft. *E. F. Warburg.* New to v.c. 6, N. Somerset.

Cololejeunea minutissima (Sm.) Schiffn. On Willow (*Salix cinerea* ssp. *atrocinerea*) with *Frullania dilatata* (L.) Dum., in an enclosure on Catcott Heath, **S.**, *A.J.W.*, conft. *E. W. Jones.* New to v.c. 6.

FUNGI. *Peronospora parasitica* (Fr.) Tul. This downy Mildew was first observed in Britain on *Hornungia petraea* (L.) Rchb. on 29 February, 1964, by G. R. Stewart in Black Rock Gully, Avon Gorge, **G.**, conft. *Miss G. M. Waterhouse.* Sporangiophores, observed by Miss E. Chittenden, were mostly confined to the rosette leaves, and some old leaves were found to contain oospores. After mid-March no plants showed signs of infection.

Puccinia Terrieriana Mayor. A conspicuous Rust of Groundsel (*Senecio vulgaris*) noted in gardens at Thornbury, **G.**, *Dr. R. W. G. Dennis*, at Dundry, **S.**, *Dr. M. F. Madelin*, and at Easton-in-Gordano, **S.**, *R.M.H.*, the last two records det. *Dr. L. E. Hawker.* This Rust was first discovered in France in 1961, and was described as a new species, but it is apparently similar to a species from Tasmania. First recorded in Britain in the same year, at Dungeness, Kent, by Dr. Dennis, it is spreading rapidly, especially to the south and west of England and Wales.

As before, Dr. Willis has most kindly assembled a number of the above records, and has identified or confirmed the specimens.

BRISTOL BIRD REPORT
1964

Compiled by the Editorial Committee of the
B.N.S. Ornithological Section

P. J. Chadwick G. Sweet
H. H. Davis M. A. Wright

THE year's most encouraging development is the increase in the number of record cards to nearly 2,000, some containing many observations. This augurs well. In the past the limited records available have precluded any quantitative treatment of population density and distribution except for Heron, wildfowl, Buzzard, Rook and gulls. The more extensive data permit reports of greater precision. This is true especially of the study of raptors which is in progress and will form the subject of future papers; meanwhile the information relating to Kestrel and Sparrowhawk in the breeding season is a useful contribution to the B.T.O. Birds of Prey Enquiry.

Amongst published records of special interest is the report of a Pied-billed Grebe at Blagdon reservoir in December 1963—the first known occurrence of this North American species in Europe. Noteworthy records for the reservoirs in 1964 include those of a Black-throated Diver at Barrow Gurney in April; a Goshawk at Chew Valley in December and, at the same place, a Temminck's Stint and a Roseate Tern in July and a Pratincole in September, while in the same month a Pectoral Sandpiper was seen at Blagdon. Reports from other localities include Green-winged Teal, Red-breasted Goose and Gyr Falcon at the New Grounds; a Shore Lark at Sand Point and Great Grey Shrikes at Charterhouse on Mendip and Ubley.

Contributors to this report should give details of identification as a matter of course for all except the most obvious species. Records not only of rare birds but also of those which can easily be confused with closely allied forms, as well as unusual occurrences of common species, need the support of *original notes taken in the field.* It should be possible for those making use of the reports in the future to have complete confidence that the original data are available and that records have been accepted on this evidence. It is clearly unscientific to publish a record solely on the strength of an observer's reputation for reliability and skill, although such qualities are most important. To assist contributors we follow the practice of the London N.H.S. in appending a list of species for which descriptions should be supplied:

Divers
Grebes (except Great Crested and Little)
Petrels and Shearwaters
Shag
Herons & Egrets (except Common Heron)
Bittern
Red-crested Pochard
Scaup
Ferruginous Duck
Long-tailed Duck
Scoters and Eiders
Red-breasted Merganser
Geese (except White-fronted)
Swans (except Mute)
Birds of Prey (except Buzzard, Sparrowhawk and Kestrel)
Crakes
Little Ringed Plover
Kentish Plover
Sandpipers (except Green and Common)
Stints
Phalaropes
Stone Curlew
Pratincole
Skuas
Glaucous Gull
Iceland Gull
Little Gull
unusual Terns
Auks
Wryneck
Golden Oriole
Willow Tit
unusual Warblers
Firecrest
unusual Pipits and Wagtails
Waxwing
Shrikes
Twite
Redpolls (except Lesser)
unusual Buntings

and any other rare or uncommon species and out of season migrants.

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Headings **G.** and **S.** refer to South Gloucestershire and North Somerset and cover the areas as outlined in previous Reports (cf. *Proc. B.N.S.*, 1960, p.114).

BLACK-THROATED DIVER *Gavia arctica*

S. One seen at close range, Barrow Gurney resrs., Apr. 6—16

(R.M.C., C.L., T.B.S. *et al.*). Sixth record for Bristol area—last noted in 1955 and 1954.

GREAT CRESTED GREBE *Podiceps cristatus*
S. Two nests already half-built, Chew Valley res., on early date of Feb. 23 (P.J.C., M.A.W.). Pilot survey of breeding pairs gave total of at least 33 broods—28(+), Chew Valley res.; one, Blagdon res.; one, Litton res.; and two, Orchardleigh Lake; nil returns from 24 other sites (per B.K.).

SLAVONIAN GREBE *Podiceps auritus*
S. One, Chew Valley res., Mar. 1 (P.J.C., M.A.W.) and two, most probably this species, Blagdon res., on 25th (W.L.R.).

BLACK-NECKED GREBE *Podiceps nigricollis*
S. Single bird, Blagdon res., July 12, Aug. 23, 26 (R.J.P.) and two, Sept. 27 – Oct. 11 (R.A., R.M.C., K.L.F., R.J.S.).

PIED-BILLED GREBE *Podilymbus podiceps*
S. One seen and filmed in colour, Blagdon res., Dec. 22, 1963 by H.A.T.: seen later in day by R.J.P. who has supplied detailed notes which stress the heavy, stubby bill and larger size than Little Grebe—*c.* two-thirds size of accompanying Coot—and these features are confirmed by the film. Record, first for Europe, accepted by *Brit. Birds* Rarities Committee.

STORM PETREL *Hydrobates pelagicus*
G. One flying over Estuary, New Grounds, Nov. 22 (L.P.A.).

MANX SHEARWATER *Procellaria puffinus*
S. Twenty flying N.E. off south side, Steep Holm, May 4. Also noted in channel, end June: six moving S., ½ m. off Brean Down, on 27th, and 32 off Steep Holm on 28th flying W. from Sand Bay area where others still feeding—total probably not less than 100 (Res. Stn.).

FULMAR *Fulmarus glacialis*
S. Single birds off Brean Down, Apr. 19 (R.F., T.R.J.W.) and Steep Holm, Sept. 2 (Res. Stn.). One dead, Sand Bay, Dec. 6 (R.A.).

SHAG *Phalacrocorax aristotelis*
S. One dead on rocks, Brean Down, Nov. 15 (R.A.); another found dying, same place, Dec. 21 (E.G.H.).

HERON *Ardea cinerea*

S. Slight increase in number of breeding pairs from 26 to 30—3, Brockley Combe; 16, Cleeve Hill; 9, Uphill Grange; 2, Newton St. Loe (per B.K.). Fairly numerous at reservoirs in autumn: max. counts—13, Blagdon, Aug. 22; 20, Cheddar, Oct. 18; and 14, Chew Valley, same date; 36, Chew Valley, Dec. 28.

BITTERN *Botaurus stellaris*

S. One shot, Englishcombe, nr. Bath, Jan. 29 (per R.J.L.). One, Chew Valley res., Feb. 8 (R.A.), 13 (C.W., F.W.)—cf. *Proc. B.N.S.*, 1963, p. 387.

MALLARD *Anas platyrhynchos*

G. and **S.** Total of *c.* 2,500 in area, mid-January, but peak occurred as usual in autumn—counts of *c.* 2,700, mid-October and *c.* 3,350, mid-November. Breeding reported from Chew Valley, Blagdon and Litton reservoirs, Midford nr. Bath and Steep Holm.

TEAL *Anas crecca crecca*

G. Counts, New Grounds, markedly lower than usual—260, Feb. 18; 300, Oct. 19, and 200, Nov. 18 (M.A.O.).

S. Winter counts continued at low level of late 1963, not reaching 500 in total, but autumn numbers increased from 450, Sept. 13 to 1,600, Dec. 13 (B.K., R.J.L., B.R. *et al.*).

GREEN-WINGED TEAL *Anas crecca carolinensis*

G. Male seen feeding with Teal, New Grounds, May 3, 4 by L.P.A. and M.A.O. who have supplied conclusive details. Record, second for Bristol area, accepted by *Brit. Birds* Rarities Committee (cf. *Proc. B.N.S.* 1949, p. 33).

GARGANEY *Anas querquedula*

G. Pair, W.T. enclosures, New Grounds, Mar. 28 (M.A.O.).

S. Male, Cheddar res., Mar. 21 (T.B.S.). Max. of three pairs, Chew Valley res., Apr. 11 (R.J.P.), 12 (M.K.) and two pairs, end May (A.H.D., B.R. *et al.*) one of which bred—female with nine ducklings, July 9 (A.P.R.). Single birds, Blagdon res., July 25–Sept. 6 (R.M.C.) and three, Aug. 16 (P.J.C., C.L.).

GADWALL *Anas strepera*

S. Small numbers were reported early in year and these were mainly at Chew Valley res. where six broods noted (R.J.P., W.L.R. *et al.*). Post-breeding population at reservoirs lower than in recent years—28, Sept. 13, and 22, Oct. 18 (W.U., A.W., K.B.Y. *et al.*); 35, Cheddar res., Nov. 7 (B.K., R.J.P.). Party of four, Weston Bay, Oct. 18 (R.A.).

WIGEON *Anas penelope*

G. and **S.** Counts, New Grounds, reservoirs and coast indicate total of *c.* 2,000 present, mid-Jan. to mid-Feb. and *c.* 1,450, mid-March. Autumn counts: 700, mid-Oct., increasing to 1,000, mid-Nov.; no count, New Grounds, mid-Dec. but 800 at reservoirs.

PINTAIL *Anas acuta*

G. and **S.** No large winter totals apart from 150, New Grounds, Jan. 12 (M.A.O.) and less than 65 in area, Feb. 16 (B.K., M.A.W. *et al.*) but larger numbers in autumn with 250 counted, mid-Nov. (K.H., J.A.McG., A.W. *et al.*)—170 of these at New Grounds (M.A.O.).

SHOVELER *Spatula clypeata*

G. New Grounds records: 60, Jan. 12; 43, Feb. 16; 21, Nov. 18, and 46, Dec. 14 (M.A.O.).

S. Only fifteen, all waters, Jan. 12 but increase to 100, mid-March due to influx at Chew Valley res., where 60 present mid- to end month (R.M.C., C.L., T.B.S. *et al.*). Breeding population, same res., of *c.* 12 pairs (R.A., B.R. *et al.*). Autumn numbers declined from 75, mid-Sept. to 60, Nov. 15, Dec. 13 (B.K., D.E.L., J.A.McG. *et al.*).

RED-CRESTED POCHARD *Netta rufina*

S. Female or immature, Cheddar res., Oct. 26 (B.R.), Nov. 7 (R.M.C., B.K., R.J.P.).

SCAUP *Aythya marila*

G. and **S.** Female in W.T. enclosures, New Grounds, end February–early March (L.P.A.). Male, occasionally two, Cheddar res., Jan. 18–Mar. 15; two males, Oct. 8 and one, Nov. 1 to end year (J.A.McG., R.D.O. *et al.*). Also one or two males, Chew Valley res., Mar. 14 to Apr. 26 (A.H.D., C.S., M.A.W. *et al.*) and single males, Blagdon res., July 15 (R.J.P.) and Barrow Gurney resrs., Dec. 28 (P.J.C.).

TUFTED DUCK *Aythya fuligula*

G. Over 100 frequently flighting into W.T. enclosures, New Grounds, from Frampton gravel pits, Jan. to mid-March and again, Oct.–Dec. (W.T.).

S. Winter counts, all waters, suggest fall from 500, Jan. 12 to 420, mid-March (R.J.L., J.F.R., W.J.S. *et al.*) but 400, Chew Valley res., Mar. 27 (B.K.). Breeding data less comprehensive than for some years but at least 8 broods, Blagdon res. (P.J.C., C.L., R.J.P., T.B.S.), 16+, Chew Valley res. (R.A., W.L.R. *et al.*) and one, Orchardleigh Lake (R.M.C.). Max. autumn count, all waters—450, Oct. 18 (J.A.McG., N.R.W., K.B.Y. *et al.*).

POCHARD *Aythya ferina*

S. Less than 400, all waters, Jan. 12, but 670, Feb. 16, total decreasing again to 340, Mar. 15 (C.L., B.R., W.U. *et al.*). A few present, Blagdon and Chew Valley resrs., during summer but no evidence of breeding. Autumn totals again fairly small—due to very low water levels, especially at Cheddar which regularly supports over 60% of population. Immigrants started arriving mid-Sept. onwards, reaching peak of 1,200, Cheddar, Nov. 1 (R.D.O.); 850 there on 5th but only 42 on 15th (J.A.McG.) when total, all waters, of 320; 430 in area, Dec. 13 (K.H., B.K., R.J.L. *et al.*).

GOLDENEYE *Bucephala clangula*

G. Male on decoy pool, New Grounds, Mar. 9 (M.A.O.).

S. Approx. 30, all waters, Jan. 26–Feb. 16, increasing to 40, early March (P.J.C., S.E.C., K.L.F., M.K. *et al.*). Max. individual counts from Chew Valley res. where 36–39 noted, Mar. 24–Apr. 5 (R.J.P., K.B.Y.). No large autumn numbers—max. being 15 (13, Blagdon; 2, Cheddar), Dec. 6 (R.D.O., R.J.S.).

LONG-TAILED DUCK *Clangula hyemalis*

S. Female or imm., Marine Lake, Weston-s-Mare, Feb. 22 to Mar. 21 (R.A.) and off Brean Down, Mar. 26 to Apr. 26 (M.K., T.B.S., T.R.J.W. *et al.*).

VELVET SCOTER *Melanitta fusca*

S. Adult male, Chew Valley res., Oct. 15 (B.C., A.H., R.J.S.).

COMMON SCOTER *Melanitta nigra*

G. Single males on Estuary, New Grounds, Mar. 26 (L.P.A.) and New Passage, July 23 (M.J.B., R.H.P.).

S. Four (3♂♂), Weston Bay, Mar. 13 (R.H.P.); six (5♂♂) on 23rd (E.G.H.), and seven (3♂♂), Apr. 25 (B.E.S.); pair, May 30 (T.R.J.W.). Four off Sand Point, Mar. 30 (K.B.Y.). Five, Chew Valley res., Mar. 15 (P.J.C., M.W.S., M.A.W.) and fifteen—equals largest inland count for Bristol area, cf. *Proc. B.N.S.*, 1958, p. 440—Mar. 21 (B.K., R.J.P.). Autumn records: one, Weston Bay, Oct. 24 (R.M.C.); single males, Blagdon res., Dec. 5 (R.J.P.), 6 (D.E.L.) and Weston Bay, Dec. 6 (T.R.J.W.)—found dead on 13th (H.G.H., R.J.S.); and female or imm., same place, on 30th (D.K.B.).

Red-breasted Merganser *Mergus serrator*

G. Female on Estuary, New Grounds, Apr. 27 (L.P.A.).

Goosander *Mergus merganser*

G. Female, New Grounds, Mar. 8 (L.P.A.).

S. Records include: two males, Chew Valley res., Jan 4 (R.M.C., B.E.S.) and three pairs on 26th (J.A.McG.); four females, Feb. 22 (B.K.) and pair, Mar. 29, 30 (G.L.B., B.K.). One, Barrow Gurney resrs., Jan. 12 (W.J.S.). Pair, Blagdon res., Feb. 2 (M.K., C.S.) and male on 22nd (T.B.S.). Autumn records: single birds, Blagdon res., Oct. 18 (A.W., K.B.Y.); Chew Valley res., Oct. 27, Dec. 23 (R.J.S.), and on 28th (R.J.P. *et al.*); and Cheddar res., Dec. 26 (J.A.McG., B.R.).

Smew *Mergus albellus*

S. Counts, Chew Valley res. include: five (1♂), Jan. 26 and seven (3♂♂), Feb. 16 (P.J.C.); six (1♂) on 22nd (B.K.); six (2♂♂), Feb. 29 (R.S.H.), Mar. 1 (P.J.C., M.A.W.); three (1♂), Mar. 6–10 (G.L.B. *et al.*) and two females on 22nd (R.J.P.); four (2♂♂), Dec. 21–30 (A.H.D., R.J.S. *et al.*). One, Blagdon res., Jan. 12 (C.L.); pair, Mar. 8 (R.S.H.); two males, same place, Dec. 19, and one on 20th (R.A., M.K.).

Shelduck *Tadorna tadorna*

S. Coastal breeding survey continued, Avonmouth to Weston-s-Mare, but accurate counting impossible owing to disturbance. Evidence, however, of further decline in number of young:—

	1961	1962	1963	1964
Full-grown	340	396	295	200/300
Juveniles	240	240	150	125

WHITE-FRONTED GOOSE *Anser albifrons albifrons*

G. New Grounds: numbers rose from 2,000, end Dec. 1963, to 3,000, Jan. 6, reaching peak 4,500, Feb. 23; departure began early March, total falling to 2,100 by 10th and only 29 on 24th, when last seen. First autumn arrivals—eight, Oct. 1; slow increase to 101, Nov. 20, and 165, Dec. 9; influx, Dec. 20/21 with 735 on 21st and 1,430 on 31st (W.T.).

S. Few records, max.—53, Batheaston, Jan. 3 (R.J.L.) and skeins flying north totalling 21, Blagdon res., Feb. 8 (R.A.) and 60, Portbury, same date (K.B.Y.). The only autumn records are—single birds, Blagdon res., Dec. 20 (M.K.), Chew Valley res., Dec. 21 (A.H.D., R.S.H., R.J.S.); 23 flying north-east, Sand Bay, Dec. 20, and 27 on 28th (R.A.).

GREENLAND WHITE-FRONTED GOOSE *Anser albifrons flavirostris*

S. One, with single *Anser a. albifrons*, Chew Valley res., Dec. 21 (R.S.H.).

LESSER WHITE-FRONTED GOOSE *Anser erythropus*

G. Single adult, New Grounds, Feb. 2, 4 (L.P.A.).

BEAN GOOSE *Anser fabalis*

G. One, New Grounds, Jan. 26, and another, Feb. 8. Adult ♂ paired to ♀ White-front, with second-winter Bean × White-front hybrid, arrived, same place, Oct. 5, and stayed to end of year (H.J.B., M.A.O. *et al.*).

PINK-FOOTED GOOSE *Anser brachyrhynchus*

G. Up to three, New Grounds, Jan.–early Feb.; seven, same place, Sept. 21 (W.T.).

DARK-BELLIED BRENT GOOSE *Branta bernicla bernicla*

G. Two, New Grounds, during January and one, Feb. 20 (W.T.).

S. Party of nine, Axe Estuary, Jan. 18, 19 (R.A.).

BARNACLE GOOSE *Branta leucopsis*

G. Eight, New Grounds, Jan. 1–10, with ninth bird on 11th; these, the most recorded at the Trust, present to 19th but only five thereafter which were joined by another, Feb. 6, and stayed to mid-March. One, same place, Dec. 31 (W.T.).

S. One, Chew Valley res., Sept. 26–Oct. 20 (B.E.S., E.M.W. *et al.*).

CANADA GOOSE *Branta canadensis*

G. Flock from Frampton gravel pits visited W.T. enclosures daily in winter. In mid-summer immatures removed and total reduced to 56 birds, all ringed. Party of 28 (only 2 ringed) arrived on Dumbles, early Dec., and often fed in W.T. enclosures but did not mix with Frampton birds (W.T.).

RED-BREASTED GOOSE *Branta ruficollis*

G. Adult male reported, New Grounds, Dec. 31, 1963, stayed to Mar. 8 (H.J.B., M.A.O., P.S. *et al.*). Record, fifth for Bristol area, accepted by *Brit. Birds* Rarities Committee. Last occurrence, 1959—cf. *Proc. B.N.S.*, 1959, p. 29.

WHOOPER SWAN *Cygnus cygnus*

G. The only records are of three, W.T. enclosures, New Grounds, Jan. 28, Feb. 9, and one, Mar. 15 (W.T.).

BEWICK'S SWAN *Cygnus columbianus bewickii*

G. New Grounds: 20–25 throughout Jan.–Feb. with 32, Jan. 31, birds departing early March but single imm. to Apr. 22; up to 25 throughout Dec. (W.T.).

S. Party of 14 (10 ads.), Yeo Estuary, Jan. 1 (M.K.). Chew Valley res.: three ads., Jan. 1 (B.R.) and two to Feb. 8 (K.L.F. *et al.*); nine (5 ads.), Mar. 15 (P.J.C.) and 13 on 28th (C.W., F.W.); 12 (5 ads.), Mar. 30–Apr. 5, and 11 on 15th (C.L., E.M.P., D.W. *et al.*). Heard in fog, Cheddar res., Jan. 5 (J.A.McG., M.G.W.) and two seen, Jan. 18, Feb. 8 (G.G.C. *et al.*). Blagdon res.: six (2 ads.), Jan. 26 (R.J.P.); 23 (14 ads.), Feb. 2 (M.K., C.S.) and up to 19, Feb. 9–22 (W.L.R., M.A.W. *et al.*); 14 (9 ads.), Mar. 7 (M.K.); four (3 ads.), Mar. 15–20 and three on 21st (R.A., R.M.C. *et al.*). Apart from two Blagdon records—five, Dec. 20 and seven on 24th—all end of year reports from Chew Valley res. where 16 (9 ads.), Dec. 21 (A.H.D., R.J.S.); only 10 on 22nd (S.E.C.) but 31 (20 ads.) on 28th (B.K., R.J.P.) and 36 (31 ads.) on 31st. (C.L.).

BUZZARD *Buteo buteo*

G. Single birds, New Grounds, Upton Cheyney and Southmead, Bristol, Mar. 27, Apr. 10, May 19; two, nr. Wickwar, Apr. 1 and one, sometimes two, nr. Marshfield, throughout year (A.A.C., P.L.G., P.T.S.).

S. Reported all months (180 sightings) with breeding season records from Mendip area (may have bred), reservoirs, Wells and Bath. Eight records of four to six together. One juv., nr. Wrington, July 26 (M.K.). The distribution of sightings suggests a breeding season population of six to ten pairs in area.

SPARROWHAWK *Accipiter nisus*

G. Records for all months, except Feb. and Nov., include New Grounds, Wick, Filton, Shirehampton and Clifton. Pair reared three young, Almondsbury (H.W.N., J.F.R., G.S.).

S. Reports (194) from over 30 distinct localities, coastal and inland, all months. Juv. identified, two localities, Aug.; pairs noted six localities, in breeding season.

GOSHAWK *Accipiter gentilis*

S. One, overhead, Chew Valley res., Dec. 6, seen by B.K. who, in a long and detailed description, stresses the large size, thickset body, bullet-shaped head and rounded wings.

MARSH HARRIER *Circus aeruginosus*

S. Female, or imm., quartering reeds, Chew Valley res., May 27 (T.B.S.).

HEN HARRIER *Circus cyaneus*

S. A harrier, St. Catherine's Valley, nr. Bath, Oct. 19, seen by R.J.L. who considered it to be a male of this species.

HOBBY *Falco subbuteo*

G. One, Filton, June 20 (R.V.C.). Single birds, New Grounds and Wick Court, three dates, last week Aug., early Sept. (L.P.A., D.R.H.).

S. Single birds, Uphill, May 22 (R.A.); Blagdon, ♂ stooped at soaring ♀ Sparrowhawk, May 9 (G.S.), July 25 (P.J.C., C.L.); Chew Valley res., Aug. 3 (K.B.Y.), Sept. 7 (H.H.D., E.M.P.), two, possibly three, Sept. 11 (H.W.N., G.S.). One flying N.E., Twerton nr. Bath, Aug. 22 (R.M.C.).

PEREGRINE *Falco peregrinus*

G. Ad. ♂, New Grounds, Jan.–Mar.; another, Apr. 5 and ad. ♂, first seen Sept. 19, until end of year (L.P.A., R.M.C., M.A.O.). One flew N.E., Sea Walls, Bristol, Jan. 28 (P.G.H.).

S. Single birds, Blagdon res., Feb. 8 and Dec. 6 (R.A., D.E.L.); Weston Bay, Mar. 22 (R.F., T.R.J.W.); Steep Holm, Oct. 6, 9 (Res. Stn.) and Sand Point, Oct. 31 (H.G.H.).

GYR FALCON *Falco rusticolus*

G. One, New Grounds, Jan. 26–Mar. 11; first seen by R.E.H. and later by P. St., G.L.W., H.R.W. and M.A.O. who noted pale grey plumage without strong markings except outer half of primaries which were darker. Record accepted by *Brit. Birds* Rarities Committee.

MERLIN. *Falco columbarius*

G. and **S.** Two ♂♂, New Grounds, Jan. 19 (B.K.) and one, Mar. 5 (L.P.A.). Single birds, Chew Valley res., Jan. 12, Mar. 21, Dec. 21 (R.S.H., B.K., K.B.Y.); Brean Down, Mar. 1, Oct. 11 (R.A.); Foxhill, Bath, Oct. 26 (R.M.C.); Cheddar res., Dec. 26 (J.A.McG.) and Blagdon res., Dec. 29 (B.K., R.J.P.).

KESTREL *Falco tinnunculus*

G. and **S.** A total of 593 records shows the species to be generally distributed over the area. The best available estimate of population density, based on data from N. Somerset only, covering an area of *c.* 470 sq. miles, is one pair per 13 sq. miles.

RED-LEGGED PARTRIDGE *Alectoris rufa*

S. Pair, Brean Down, at intervals throughout year (R.A., T.R.J.W.). One, nr. Midsomer Norton, Feb. 19 (G.G.C.); three, Wrington Warren, Sept. 19, and six, Goblin Combe, Nov. 29 (M.K.).

QUAIL *Coturnix coturnix*

G. and **S.** Two calling, Marshfield, June 24; one, July 23, and one seen on 24th (R.M.C.). One, Clapton Moor, May 17 (R.D.); several, Freshford, June 8–18 (S.M.L.).

WATER RAIL *Rallus aquaticus*

S. Single birds, Sand Bay, Feb. 2, Oct. 25, Nov. 1, and two on 22nd; one, Yeo Estuary, Oct. 18 (M.K., T.B.S.). Present throughout year, Chew Valley res. (max. of three, Oct.) where juv. seen, July 28, and two juvs., Sept. 8 (P.G.H., R.J.S., K.B.Y.). Other inland records—single birds, Yatton, Sept. 26, and Congresbury, Oct.

18—both found dead (J.M.H., A.B.R.); Velvet Bottom, nr. Charterhouse, Nov. 29 (R.M.C.) and three, Blagdon res., Dec. 19 (R.A.).

Spotted Crake *Porzana porzana*

G. One ringed, New Grounds, Oct. 21—seen until 24th (S.T.J., M.A.O.).

S. Single birds, Chew Valley res., Aug. 3, 9 (D.W.) and Dec. 31 (J.R.)—field notes supplied.

Corncrake *Crex crex*

S. One, calling repeatedly, Middle Hope, Sand Point, May 10 (E.K., M.K.).

Oystercatcher *Haematopus ostralegus*

G. and **S.** New Grounds: single birds frequently to end Sept., but sixteen, July 23 (L.P.A.).One, R. Avon, Pill, Mar. 1 (J.F.B.); one overhead (calling), Wrington, July 31 (M.K.). Reservoir records for March, May, Aug. and Sept., with max. of five, Chew Valley, Aug. 5 (K.L.F., R.J.P., K.B.Y. *et al.*). Highest coastal count—100, Weston Bay, Nov. 21 (R.A.). Ad. recovered, Sand Bay, Dec. 12, had been ringed, Flint, 135 m. N., 15/11/63 (R.A.).

Lapwing *Vanellus vanellus*

S. Few breeding season records but pairs reported from Nailsea, Clevedon, Kenn Moor, Gordano Valley and Woodspring. Southerly movements totalling *c.* 1,000 birds, in hard weather over Whitchurch, Dec. 28 (K.L.F.); *c.* 800 on similar course, Nailsea, on 29th (M.V.T., S.M.T.). 2,000–3,000, Emborough, Dec. 21 (R.S.H.); 1,000+, Chew Valley res., on 27th and 28th (D.K.B., B.K.).

Little Ringed Plover *Charadrius dubius*

S. Single birds, Chew Valley res., Apr. 30 (R.S.H.); July 18–Aug. 8 (R.A., R.M.C., B.E.S., K.B.Y. *et al.*).

Grey Plover *Charadrius squatarola*

G. and **S.** New Grounds: max.—up to eleven, Jan. 5–May 25; twenty, Oct. 2–8 (L.P.A.). 42, Yeo Estuary area, Jan. 4; ten, Apr. 12 (M.K.); and up to fifteen, Oct. 3–Nov. 1 (M.K., T.B.S., K.B.Y.). Two, Blagdon res., Sept. 27 (R.J.P.) and one, Oct. 25–Nov. 7 (R.M.C., M.K., K.B.Y.).

GOLDEN PLOVER *Charadrius apricarius*

G. New Grounds: one of northern form, *C. a. altifrons*, in full breeding plumage, May 26 (L.P.A.).

S. 130, Charmy Down, Bath, Feb. 29 (R.J.L.); 100, Saltford, various dates, Feb.–Mar., Nov.–Dec. (P.T.S.); 40, Marksbury, mid-Apr., including one of northern form (R.M.C., B.K., K.B.Y.). Up to 80, Chew Valley res., Sept. 23–Nov. 29 (various observers); at least 300, same place, Dec. 13 (K.B.Y.). 400, Weston Bay, Nov. 22 (R.A.). 170, Nailsea Moor, Dec. 22 (E.C.).

TURNSTONE *Arenaria interpres*

G. One, New Grounds, May 23–25, and up to six, July 24–Aug. 19 (L.P.A.). Eleven, Sheperdine, Sept. 19 (J.D.R.V.); 125, Chittening, on 22nd (R.J.P.).

S. Yeo Estuary: nineteen, Feb. 16; four, Sept. 27 (R.J.P.), and 25, Oct. 3 (M.K.). Weston Bay area: one, Apr. 19 (J.M.H.), May 31 (R.A.), July 26 (T.B.S.); two, Dec. 6 (R.A.) and one on 13th (R.J.S.). Chew Valley res.: one, Aug. 1 (R.A.); five, Aug. 19 (R.J.S.) and one on 29th (R.A.).

JACK SNIPE *Limnocryptes minimus*

G. and **S.** One, New Grounds, Sept. 27, Dec. 12 (L.P.A., M.A.O.). One, Corston, Mar. 15 (P.T.S.). Chew Valley res.: two, Feb. 16 (R.J.P.); four, Apr. 12 (R.J.P., K.B.Y.); up to four, Nov. 8 to end of year (various observers). Two, Blagdon res., Apr. 5 (M.K.). One, Cheddar res., Oct. 18 (J.A.McG.).

WOODCOCK *Scolopax rusticola*

S. Single birds, nr. Bath, Feb. 1 (R.J.L.) and Mar. 15 (P.T.S.); Long Ashton, May 4 (J.E.A.); St. Catherine's Valley, July 5 (R.M.C.); Dolebury Warren, Nov. 3 (S.I.B.) and Brean Down, Oct. 18–Nov. 8 (R.A., E.G.H., T.R.J.W.).

CURLEW *Numenius arquata*

S. Breeding season records from Gordano Valley, Hinton Blewitt and Charterhouse (Mendip).

WHIMBREL *Numenius phaeopus*

G. and **S.** Regular migrant, both passages, Severn Estuary and inland. Maximum counts: inland, 37, Stoke Moor, nr. Cheddar, May 2 (T.B.S.); coastal, 20, Yeo Estuary, May 2 (M.K.).

Black-tailed Godwit *Limosa limosa*

G. and **S.** New Grounds: sixteen, July 16; 28, Aug. 7; 33, Sept. 3; ten, Oct. 8; one, Nov. 21 (L.P.A.). Chew Valley res.: one, May 9, 10 (R.S.H., R.J.S.); ten, Aug. 16 (R.J.S.); six, Sept. 20 (R.S.H.); twelve, Oct. 3 (T.B.S.); two, Dec. 31 (C.L.). Up to ten, Blagdon res., Aug. 15–Sept. 20 (many observers). Single birds, Cheddar res., Aug. 19 (A.D.) and R. Avon, Pill, Nov. 29, Dec. 23 (K.B.Y.). Five, Sand Bay, May 27, and four, Oct. 11 (R.A.). Two, St. George's Wharf, Sept. 7 (J.D.R.V.).

Bar-tailed Godwit *Limosa lapponica*

G. and **S.** New Grounds: fifteen, Apr. 26; one, Aug. 16; up to seven, Sept.; two, Nov. 1 (L.P.A.). Seven, New Passage, Aug. 13 (R.H.P.). Chew Valley res.: one, Mar. 15 (P.J.C., M.A.W.); seven on 28th (B.E.S.); one, Sept. 12, 13 (various observers) and two, Nov. 25 (S.M.L.). Three, Blagdon res., Aug. 31 (K.L.F.); one, Sept. 2 (E.M.P.). Coastal records include: eleven, Sand Bay, Apr. 5 (T.B.S.); six, mouth of Avon, Apr. 12 (K.B.Y.); 35–40, Weston Bay, Nov. 1 (P.J.C., M.A.W.), Dec. 13 (H.G.H., R.J.S.); 30, Clevedon, Nov. 8 (R.J.S.).

Green Sandpiper *Tringa ochropus*

G. and **S.** New Grounds: up to four, June 24 to end July; single bird frequently, Aug.–Nov. (L.P.A.). One on stream, Hinton, nr. Dyrham, Nov. 21 (P.L.G.). Chew Valley res.: one, Mar. 1–29 (G.L.B., R.M.C., R.J.S.); six, June 28 and over 30, July 24 (R.S.H.); up to max. of fourteen, Aug.–late Oct. (R.S.H., J.A.McG.). Blagdon res.: up to three, Aug. to mid-Oct. (P.J.C., M.K. *et al.*). Single birds, Portbury, July 22 (K.B.Y.) and Litton res., Aug. 3 (R.J.P.).

Wood Sandpiper *Tringa glareola*

S. Reservoirs: single birds, Cheddar, Aug. 19–22 (J.A.McG., B.R.); Chew Valley, Aug. 22 (R.M.C.), Sept. 13 (J.E.A.); and Blagdon, Sept. 11 (P.J.C.).

Redshank *Tringa totanus*

S. No breeding records. Coastal flocks again smaller than usual: max. 60, mouth R. Avon, Mar. 1 (J.F.B.); 50+, near Clevedon, Aug. 21 (A.J.T.); 75, Sand Bay, Oct. 11 (R.A.).

SPOTTED REDSHANK *Tringa erythropus*

G. and **S.** New Grounds: one, June 17, July 8; up to eighteen, Aug. 30–Oct. 2, and one, Nov. 1, 8 (L.P.A.). Chew Valley res.: one, sometimes two, Mar. 27–Apr. 30 (K.L.F., R.S.H., B.K.); two, in summer plumage, June 17 (R.J.P.); three, July 18 (R.A.); up to eighteen, Aug.–early Oct. (many observers); three, Nov. 8 (R.S.H.). Blagdon res.: max. fifteen, Sept. 19 (P.J.C.); one, Oct. 11, 17 (K.L.F., M.K.). Cheddar res.: one, Oct. 3 (R.M.C.). Single birds, Sand Bay, Aug. 12 (R.A.), 26 (T.B.S.) and Brean Down, Nov. 21 (T.R.J.W.).

GREENSHANK *Tringa nebularia*

G. and **S.** New Grounds records include: one, Apr. 25; four, May 19; five, Aug. 16, Sept. 12–14, and one, Oct. 1–3 (L.P.A.). One calling over Clifton, Aug. 9 (G.S.). Chew Valley res.: one, Apr. 12 (B.R.); up to twelve, Aug. to early Oct. (many observers); one, Nov. 29 (D.W.). Blagdon res.: three, July 18 (C.L.); 23, Aug. 23 (R.J.P.); nine, Sept. 13 (J.A.McG.) and two on 21st (B.R.). Cheddar res.: three, Aug. 20, and two on 27th (A.D., J.A.McG.). Yeo Estuary: one, May 2; at least sixteen, Aug. 22; max. of twelve, same place, Sept.–Oct.; one, Nov. 1 (M.K.). One calling, Saltford, Aug. 31 (B.K.).

KNOT *Calidris canutus*

G. and **S.** New Grounds: four, May 26; autumn max. 22, Sept. 27 (L.P.A.). Reservoirs: one, Cheddar, Jan. 18, 19 (G.G.C., T.L. *et al.*); one, sometimes two, Chew Valley, Feb., Apr., Aug. (G.L.B., B.K., M.K., K.B.Y.), and one, Blagdon, Aug. 23–30 (many observers). Coastal max.: *c.* 3,500, Weston Bay, Dec. 19 (R.A.).

PURPLE SANDPIPER *Calidris maritima*

G. and **S.** Two or three, with Turnstones and Dunlin, Severn Beach, Dec. 28 (A.H.D.). One on rocks, Brean Down, Jan. 1 (T.R.J.W.).

LITTLE STINT *Calidris minuta*

G. and **S.** New Grounds: two, Sept. 17, and four on 18th and 20th; two, Oct. 6 (L.P.A.). One, sometimes two, Chew Valley res., Aug. 15–Sept. 26 (R.A., J.A.McG., B.E.S., N.R.W.). Single birds, Cheddar res., Sept. 24 (J.A.McG.), and Woodspring Bay, Oct. 11 (T.B.S.).

TEMMINCK'S STINT *Calidris temminckii*

S. One, Chew Valley res., July 26, 27 (R.A., R.B., R.J.P.); field notes supplied.

PECTORAL SANDPIPER *Calidris melanotos*

S. One, Blagdon res., Aug. 30–Sept. 8, was first identified and fully described by R.M.C. and R.P.; bird subsequently seen (in company with Greenshanks, Ruffs and a Dunlin) by S.E.C., M.K., T.B.S. and others.

DUNLIN *Calidris alpina*

G. and **S.** New Grounds max.: 1,700, Apr. 23; 1,500, July 21 (L.P.A.). Reservoir records include: 76, Chew Valley, April 15 (R.J.P.) and 430 (a high figure), Dec. 13 (B.K.); at least 120, Cheddar, Nov. 29 (J.A.McG., B.R.); 80, Blagdon, Dec. 6 (A.H.D.).

CURLEW SANDPIPER *Calidris testacea*

G. and **S.** Up to four, New Grounds, Sept. 17–Oct. 1 (L.P.A.). Single birds, Blagdon res., Aug. 22 (M.K.), Sept. 9 (G.L.B.); Sand Bay area, Sept. 7 (R.A.), Oct. 11 (T.B.S.) and nr. Clevedon, Oct. 31 (K.B.Y.).

SANDERLING *Crocethia alba*

G. and **S.** New Grounds records include: thirteen, May 8, June 7; six, Sept. 3, 4 (L.P.A.). Few coastal records: two, Steep Holm, May 3 (Res. Stn.); three, Weston Bay–Sand Bay, May 9, Aug. 30 (R.A.). One, Cheddar res., Aug. 18 (T.B.S.).

RUFF *Philomachus pugnax*

G. and **S.** Up to three, New Grounds, July 24–Nov. 22 (L.P.A). Chew Valley res.: one, various dates, mid-Jan. to mid-Apr.; two, July 12; up to six, Aug.–Sept.; one, Oct. 31 (R.M.C., B.E.S. *et al*). Blagdon res.: up to eleven, Aug.; three, Sept. 2, 5; one, Oct. 11 (S.M.L., N.R.W., K.B.Y. *et al.*). Cheddar res.: two, Aug. 7; four Sept. 6; one, sometimes two, Oct.–Dec. (B.K., R.J.P., B.R. *et al.*).

PRATINCOLE *Glareola pratincola*

S. One, showing characters of the black-winged phase (with dark underwing), Chew Valley res., Sept. 6–8; first seen and identified by M.L. and J.S. and later by R.M.C., H.H.D., G.S. *et al.* Record, first for Bristol area, accepted by *Brit. Birds* Rarities Committee.

Arctic Skua *Stercorarius parasiticus*

G. One, imm., dark phase, New Grounds, June 27 and one, light phase, July 21 (L.P.A.).

Common Gull *Larus canus*

S. At least 1,000, Chew Valley res., Feb. 1 (R.S.H.) and 400, Herriott's Bridge, Mar. 6 (W.L.R.). Coastal records include 1,000, Weston Bay, Dec. 25 (R.A.).

Little Gull *Larus minutus*

G. and **S.** One, imm., New Grounds, June 9 (L.P.A.). First-winter bird, Chew Valley res., Apr. 19–26 (B.K., B.R. *et al.*); one, ad., Aug. 22 (R.M.C., B.E.S.) and one, imm., Sept. 22 (K.B.Y.). Single juvs., Cheddar res., Aug. 19–22 (A.D., J.A.McG., B.R.) and Blagdon res. on 29th (M.K.).

Kittiwake *Rissa tridactyla*

S. One imm., Chew Valley res., Apr. 21, 26 (K.L.F., T.B.S.) and one found dead, same place, Apr. 26 (J.A.McG.). Single imm., Sand Bay, Sept. 9, and one, found dead, Dec. 20 (R.A.).

Black Tern *Chlidonias niger*

G. and **S.** Spring passage: up to 14, New Grounds, May 17–June 3 (L.P.A.); one, Blagdon res., Apr. 19 (H.H.). Autumn passage: Chew Valley res., July 6–Oct. 11, with max. 30, Aug. 17 (G.L.B., P.J.C., T.B.S.); Blagdon res., July 18–Sept. 20, max. 11, Aug. 27 (D.K.B., G.C.B., S.I.B.); Cheddar res., Aug. 17–Oct. 8, max. 10, Aug. 22 (A.D., B.R., N.R.W.) and up to three, New Passage, Sept. 17 (R.H.P.).

Common Tern *Sterna hirundo* Arctic Tern *Sterna macrura*

G. and **S.** Spring passage showed max. 29, New Grounds, May 17, and up to four, Chew Valley res., Apr. 15–30 (L.P.A., T.B.S., K.B.Y.). Recorded on return passage, Estuary and resrs., June 8–Oct. 8; max. 30, Chew Valley, Sept. 2 (B.C.P., E.M.P., N.R.W. *et al.*).

Roseate Tern *Sterna dougallii*

S. One, Chew Valley res., flying W., July 18 (R.A.); long tail streamers, pale grey upper parts and very white underparts noted.

LITTLE TERN *Sterna albifrons*

S. One, Chew Valley res., Oct. 31 (K.L.F.), a late date.

SANDWICH TERN *Sterna sandvicensis*

S. Single birds, Cheddar res., Apr. 18, Aug. 17, and two, Sept. 17 (R.M.C., T.B.S. *et al.*). One, Chew Valley res., Sept. 17 (G.L.B.).

RAZORBILL *Alca torda*

G. One, ad., harried by gulls, close inshore, New Passage, Sept. 17 (R.H.P.).

S. Adult, Steep Holm, June 27, 29 (Res. Stn.) and one, dead in tide-wrack, Uphill, Axe Estuary, July 11 (R.A.).

GUILLEMOT *Uria aalge*

S. One, long dead, Sand Bay, Dec. 6 (R.A., T.B.S.).

STOCK DOVE *Columba oenas*

G. Reports from six localities, Feb.–June (R.A., C.L., R.J.P.).

S. Recorded in breeding season from eight widely separated areas (P.J.C., M.K. *et al.*). Two, Steep Holm, June 27, and one, July 1 (Res. Stn.).

COLLARED DOVE *Streptopelia decaocto*

G. Now well established in Bristol where 35–40 pairs located—many breeding—mainly in Shirehampton (18 pairs), Sneyd Park–Stoke Bishop (at least 5 pairs) and Clifton (8 pairs). Flocks of 175–200, Avonmouth Docks and fifteen, Clifton Zoo (30 in January), Sept.–Nov., suggest total of *c.* 250 in City of Bristol (per P.J.C., C.L.). Two pairs, Downend (D.M.S., R.H.P.) and pair, Mangotsfield (J.D.R.V.). Also resident and breeding around Slimbridge—ten pairs early in year; three nests, March–April; up to 30, early November (M.A.O.).

S. Only two records within Somerset part of Bristol—one, Brislington (M.W.) and pair, Bedminster (M.K.). Bred, Pill (J.F.B.) and probably at Clevedon (P.F.). Present throughout year, Weston-s-Mare, where up to eight seen, August (R.A.). Also reported from Portishead (at least 4 birds, possibly 3 pairs), Mar.–Aug. (C.G. *et al.*), Sand Point (R.H.P.), Blagdon (G.H.), Bishop Sutton (5 on May 10, A.P.R.) and Cheddar (J.A.McG.).

CUCKOO *Cuculus canorus*

G. and **S.** Reports from 16 localities include one flying S.E., Broadmead, Bristol, July 27 (C.L.); juv. in nest of Reed Warbler, Chew Valley res., July 26 (D.W.); another juv., Brean Down, Aug. 16 (R.A.) and three, Winterbourne, early Sept. (J.J.). In view of a suspected decline in numbers elsewhere, all future records will be of value.

BARN OWL *Tyto alba*

S. The only records are of single birds, Chew Valley res., Jan. 20, Oct. 21, 29, Dec. 20 (K.L.F., D.W.); Blagdon res., Sept. 8 (C.L.); Kingston Seymour, Oct. 21, 24 (M.K.). Not seen on Yatton Moor, where often noted previously (H.H.D.).

LITTLE OWL *Athene noctua*

G. Records of twelve birds (10 in breeding season), all from coastal plain, R. Avon to Thornbury (P.G.H., C.L., J.D.R.V. *et al.*).

S. Reported all months (49 sightings) from 18 localities extending from coast to Bath area (P.J.C., R.M.C., C.L. *et al.*).

TAWNY OWL *Strix aluco*

G. and **S.** Reported from all well-observed localities, all months—77 records. Breeding proved, New Grounds, Clifton, Leigh Woods, Clapton Moor and Oakford, nr. Bath (P.J.C., R.M.C., A.P.R. *et al.*).

SHORT-EARED OWL *Asio flammeus*

S. Single birds, Cadbury Camp, Clevedon and Clevedon Moor, Sept. (H.H.D., F.V.); at least one, North Hill, nr. Priddy, Dec. 11 (B.R.).

KINGFISHER *Alcedo atthis*

G. and **S.** Increase in records (48) from rivers Frome, Avon, Kenn, Yeo and reservoirs in breeding season suggests some recovery. Bred nr. Chew Stoke (the late T. H. Payne per S.M.T.). One found dead, Chew Stoke, Apr. 19 (D.W.).

HOOPOE *Upupa epops*

G. Single birds, King's Weston Down, April, 1963, and Westbury-on-Trym, June (M.B.P.).

S. One, Blagdon Hill, May 17 (A.C.).

GREEN WOODPECKER *Picus viridis*

S. Sixty records (only nine, 1963), all months, indicate some recovery. Successful breeding reported, Clapton Wick and Goblin Combe (M.K., A.J.T.).

GREAT SPOTTED WOODPECKER *Dendrocopos major*

S. Unusually low nest-site, four feet from ground in Cherry, Saltford, May–June (P.T.S.).

LESSER SPOTTED WOODPECKER *Dendrocopos minor*

G. Noted, nr. Wick, November (D.R.H.).

S. Single birds, Ubley and Blagdon res., May–Oct. (R.A., M.K., G.S.). Ad. feeding young in Alder, nr. Claverton, June 11 (R.M.C.).

WRYNECK *Jynx torquilla*

G. Ad. found dead, Wick, Aug. 1963 (D.R.H.).

S. Single birds, Flax Bourton, Apr. 28, and Backwell, Sept. 5 (G.E.C.).

WOODLARK *Lullula arborea*

S. One on Mendip, May 16 (K.L.F.); three, Brean Down, Oct. 18, and one on 27th (T.R.J.W.)—the only records.

SHORE LARK *Eremophila alpestris*

S. Good views of one (considered to be ad. ♂), Sand Point, Oct. 18 (G.C.B., S.I.B.).

HOUSE MARTIN *Delichon urbica*

S. Early date: one, Cheddar res., Mar. 19 (J.A.McG.). Three pairs, Wrington, reared young from nests under eaves of unfinished houses despite scaffolding activities throughout (M.K.).

SAND MARTIN *Riparia riparia*

S. About 120 at reed-bed roost, Chew Valley res., Apr. 12 (M.K.). Colony of *c.* ten pairs in wall drains, Parson Street Station, Bedminster, May 8 (J.F.B.). One, Saltford, on late date of Oct. 24 (B.K.).

RAVEN *Corvus corax*

S. Brean Down: breeding again reported; up to four noted, various dates, Jan.–May (R.A. *et al.*). One, Cheddar, Feb. 2 (J.A.McG.), and birds frequently seen, July–Dec., in other Mendip localities including Blagdon, Charterhouse, Stock Hill, Wavering Down and Burrington, with max. of six flying towards coast, July 15 (S.I.B., R.J.P., D.S., T.B.S. *et al.*). One, sometimes two, over Cadbury Camp ridge and adjoining moors, several dates, Mar.–Apr., Oct.–Nov. (H.H.D., H.R.H., P.G.H.). Steep Holm: one or two, Oct., but no sign earlier of breeding (Res. Stn.).

CARRION CROW *Corvus corone corone*

S. Pair bred, Steep Holm; nest with egg, May 1 (Res. Stn.). 140 feeding on stranded Swan Mussels, Blagdon res., Oct. 31—many rising with mussels in their bills and dropping them; 200+, same place, Apr. 14, and several dates, Nov.–Dec. (M.K., R.J.P.).

HOODED CROW *Corvus corone cornix*

S. One, with Jackdaws, in arable field, top of West Hill, Wraxall, Mar. 29–31 (H.H.D., M.A.W.). One nr. Ubley, Apr. 19 (K.B.Y.).

ROOK *Corvus frugilegus*

G. A 50% sample count at Rookeries in Severn Vale census area by H.J.B., M.A.O. and S.M.T. showed an estimated nest density of 19.1 per sq. mile compared with 21.0 in 1963; 22.8 in 1962, and 24.6 in 1961—a steady decline of 9% per ann. compared with a 2% per ann. increase from 1933 to 1956.

WILLOW TIT *Parus montanus*

S. One (a solitary bird) seen and heard, Holcombe Woods, Dec. 26 (R.S.H.).

LONG-TAILED TIT *Aegithalos caudatus*

G. and **S.** Reported widely, breeding season and in autumn parties, with numbers apparently back to normal. Records from Marshfield, Tortworth, Clevedon, Chew Stoke, Stanton Drew, Blagdon and elsewhere (A.A.C., G.S., A.J.T., D.W. *et al.*).

TREECREEPER *Certhia familiaris*

S. Of nineteen Wellingtonias (Sequoiadendron giganteum) examined, Ashton Park, in March, twelve were found with roost cavities; four roosting birds seen (A.B., J.B.). One caught, Steep Holm, Oct. 9 (Res. Stn.).

WREN *Troglodytes troglodytes*

G. and **S.** Numbers not everywhere back to normal but in many localities is apparently making a good recovery.

DIPPER *Cinclus cinclus*

G. One, R. Boyd, Wick, Jan. 17 (D.R.H.).

S. Single birds on stream, Cheddar village, Jan. 26, Feb. 16 (P.J.C., M.A.W.) and on stream, Stratton Moor, Feb. 11 (R.S.H.). Midford (Bath): one, carrying food, May 10, and one, imm., July 20, and one or two, various dates, Nov.–Dec. (R.M.C.). One, Shockerwick, same area, Nov. 7 (R.M.C.).

FIELDFARE *Turdus pilaris* REDWING *Turdus musicus*

S. Up to 600 Fieldfares and 2,000 Redwings roosting, Goblin Combe, Cleeve, Nov.–early Dec., and up to 15,000 Redwings (a few Fieldfares), Rowberrow Warren, in same period; latter roost much reduced (1,800 or less) by mid–Dec. (M.K., R.J.P., D.S., T.B.S.). **S.** and **G.** Large cold weather movement of Redwings, mostly S. to S.E., noted, Sand Bay and Clevedon, Dec. 27 (R.A., A.J.T.), and in Downend (Bristol) area on same day and during night to dawn of 28th (R.H.P.).

RING OUZEL *Turdus torquatus*

G. and **S.** Pair, Filton golf course, Mar. 25 (R.A.); one, Rodway Common, Mangotsfield, Mar. 28 (P.L.G.). Two, Brean Down, Mar. 31 (M.A.S., T.B.S.); seen also Clevedon, same day, and Apr. 6 (A.J.T.). One, Brean Down, Sept. 2, and one Sand Point, on 12th (R.H.P.).

STONECHAT *Saxicola torquata*

G. and **S.** One or two, Rodway Common, Mangotsfield, early Nov. (P.L.G.). Frequently noted, up to six or more, Brean Down, and up to nine, Sand Point, Jan.–Mar. and Sept.–Dec.; autumn/winter records also from Black Down and Charterhouse, Blagdon and Chew Valley resrs. (many observers). Breeding, or breeding season, records from Brean Down, Sand Point and Dolebury Warren (R.A., S.I.B., T.R.J.W. *et al.*).

WHINCHAT *Saxicola rubetra*

G. and **S.** Coastal and inland passage records from widely scattered localities. Breeding season reports from Shipham, Chew Valley res. and Weston-in-Gordano (J.F.B., S.I.B., A.H.D. *et al.*).

BLACK REDSTART *Phoenicurus ochruros*

S. Single birds on sea-wall, Kingston Seymour, Jan. 1, and on building site, Wrington, Apr. 26 (M.K.). Brean Down: one, sometimes two or three, various dates, Jan.–Mar. (K.L.F., B.R., B.E.S. *et al.*); one, May 16, "singing vigorously on buildings, West tip, as if marking out territory. Not seen subsequently." (T.R.J.W.). One trapped, Steep Holm, Oct. 9 (Res. Stn.).

NIGHTINGALE *Luscinia megarhynchos*

G. and **S.** Six in song, Michael Wood, nr. Tortworth, Apr. 26 (A.P.R.). Singing birds reported from Leigh Woods, Claverton, Walton-in-Gordano, Chew Valley and Axbridge (J.F.B., P.G.H., K.B.Y. *et al.*). One, Brean Down, July 25 (T.R.J.W.).

GRASSHOPPER WARBLER *Locustella naevia*

G. Up to four singing, Oakford, nr. Marshfield, from mid-Apr. (A.A.C., R.M.C.). Eight singing, Inglestone Common (Hawkesbury Upton), Apr. 30, and twelve singing, Michael Wood (Tortworth), May 17 (A.P.R.).

S. Singing birds noted in many localities—coastal and inland. Nestling ringed (AK69028), Leigh Woods, 7/6/63, recovered 400 m. S. by lighthouse, Pointe de la Coubre, France, 4/9/64 (P.J.C.)—only the second foreign recovery of a British-ringed specimen.

REED WARBLER *Acrocephalus scirpaceus*

G. and **S.** Breeding season records from Littleton-on-Severn, Blagdon, Weston-in-Gordano, Chew Valley and Bleadon (J.F.B., A.H.D., C.L. *et al.*). Juv. ringed (AB28129), Littleton-on-Severn, 19/8/61, retrapped Sharpness, 21/7/64 (P.J.C.).

BLACKCAP *Sylvia atricapilla*

S. Wintering female, Saltford, various dates, Jan.–Feb. (R.J.P., P.T.S.); two males, same place, Feb. 28 (P.T.S.).

CHIFFCHAFF *Phylloscopus collybita*

G. One ringed (AK69183), Littleton-on-Severn, Sept. 12, recovered *c.* 900 m. S., Vizcaya, N. Spain, Nov. 24 (P.J.C.).

WOOD WARBLER *Phylloscopus sibilatrix*

Singing birds—**G.** Hallen and nr. Marshfield, and **S.** Leigh Woods, Cleeve, Combe Down (Bath), Shipham, Ebbor, Emborough, Weston-s-Mare and nr. Wells (many observers).

GOLDCREST *Regulus regulus*

S. About fifteen (8 trapped), Steep Holm, Oct. 8 (Res. Stn.).

PIED FLYCATCHER *Muscicapa hypoleuca*

G. and **S.** Male, Hambrook, Apr. 19 (J.J.). Three in oak trees, Filton golf course, Sept. 17 (R.A.). Single males, Leigh Woods, Apr. 17 (R.C.) and Weston Woods on 23rd (R.A.). Aug./Sept. records (single birds) from Clevedon, Brean Down and Weston Woods (R.H.P., A.J.T., T.R.J.W.).

TREE PIPIT *Anthus trivialis*

G. and **S.** Reported widely in breeding season from Cotswold, Mendip and lowland localities.

ROCK PIPIT *Anthus spinoletta petrosus*

S. Inland records: single birds, Cheddar res., Feb. 1 (W.L.R.) and three occasions, Oct.–Dec. (R.M.C., B.K., J.A.McG.).

WATER PIPIT *Anthus spinoletta spinoletta*

S. Chew Valley res.: four, Jan. 18 (R.M.C.); one, Feb. 16 (B.K.); one or two, various dates, late Mar. (R.J.P., B.E.S. *et al.*) and one, Dec. 19 (R.M.C.). One or two, Cheddar res., early Nov. to mid-Dec. (B.K., T.B.S. *et al.*).

GREAT GREY SHRIKE *Lanius excubitor*

S. One, usually on overhead wires or isolated trees, Charterhouse, Mendip, frequent occasions, Nov. 21–Dec. 8 (R.A., G.C.B., M.K., T.B.S. *et al.*); a second, and brighter looking, bird seen, Ubley, Nov. 28, by M.K. who has supplied a full description.

RED-BACKED SHRIKE *Lanius cristatus*

S. One report only—a male on Mendip, May 14 (E.M.W.).

HAWFINCH *Coccothraustes coccothraustes*

S. Ad. on nest, Leigh Woods, May 18 (P.J.C.). One, Chilcompton, Oct. 21 (R.S.H.).

SISKIN *Carduelis spinus*

G. One, Slimbridge, Sept. 17 (L.P.A.)—early date. One or two, Filton, several dates, Oct.–Dec. (R.A.).

S. Records include: 20, Chew Valley res., Jan. 19 (K.L.F.) and ten, Feb. 16, Dec. 28 (B.K., R.J.P.); 35, Blagdon, Mar. 22, 30

(P.J.C., M.K.) and 25, Nov. 21 (R.J.P., D.S.); 20, Goblin Combe, Cleeve, Mar. 28 (M.K.). Small parties (usually less than 6 birds) also noted: Shipham, Sand Point, Brean Down, Steep Holm and elsewhere.

LESSER REDPOLL *Carduelis flammea cabaret*

G. One nr. Marshfield, Mar. 1 and parties of eight and eleven, same locality, Oct. 25, Nov. 22 (A.A.C.). One, Slimbridge, July 17 and four (usually in W.T. enclosures), Oct. 7–Nov. 22 (L.P.A.).

S. Autumn/winter records, usually of singles or small parties, from Ashton Park, Blagdon, Chew Valley, Litton, Yeo Estuary, Wick St. Lawrence, Emborough, Chilcompton and elsewhere.

CROSSBILL *Loxia curvirostra*

G. and **S.** Up to fifteen in larches, Filton, Jan.–early Mar. (R.A.). Parties of six to twenty or more, Blagdon res., frequent intervals, Jan.–early Apr. (many observers). Eighteen in plantation, Failand (where a pair may subsequently have bred), Jan. 19 (R.H.P.). Twelve, Wrington, Mar. 28 (M.K.), and fourteen, Clapton-in-Gordano, on 29th (H.H.D.). Smaller parties, Jan.–May, at Tickenham, Litton, Shipham and Holcombe Woods (J.B., T.B.S. *et al.*).

BRAMBLING *Fringilla montifringilla*

G. and **S.** Reported in small numbers from many widely scattered localities, but 50 in kale field, nr. Marshfield, Feb. 16 (A.A.C.) and 100 on stubble, with 500 Chaffinches, Priddy, Mendip, Dec. 6 (J.A.McG.).

CORN BUNTING *Emberiza calandra*

G. Two on open farmland nr. Mangotsfield, May 20 (P.L.G.). Several in song, Tormarton, June 6 (J.D.R.V.). One seen and heard nr. Marshfield, Nov. 22 (A.A.C.).

S. One on sea-wall, Kingston Seymour, Jan. 18 (M.K.). Single birds, Charterhouse (J.D.R.V.), and in Bath district at Charmy Down, Midford and Corston, Apr.–June (R.J.L.). Two or three, Saltford, mid-Apr. (B.K.) and on Lansdown, June–July (R.M.C., R.J.L.). Single birds, Felton Common, July 6, 9 (D.W.) and Yoxter on 30th (P.G.H.). One, Chew Valley, Nov. 7 (R.J.L.).

CIRL BUNTING *Emberiza cirlus*

Breeding season records from **G.**—Shirehampton (P.G.H.) and **S.**—Kewstoke, Worlebury, Cleeve, Wrington, Shipham, Axbridge and Cheddar (various observers).

SNOW BUNTING *Plectrophenax nivalis*

S. Coastal localities: single birds, Brean Down, Mar. 31 (M.A.S., T.B.S.), Oct. 24 (R.M.C.), Nov. 11 (F.V.); and Clevedon—one, Nov. 8 (R.J.S., M.J.Y.) but two seen, same date (F.V.).

TREE SPARROW *Passer montanus*

Reported throughout year from many parts. Breeding season records from **G.**—Kingsweston, Northwick, Dodington and Pucklechurch, and **S.**—Chew Valley, Cleeve, nr. Bath and Midsomer Norton. Tree Sparrows (4) and House Sparrows (12) seen as migrants, tip of Brean Down, Oct. 18 (R.H.P.).

SPECIES REPORTED BUT NOT INCLUDED IN THE SYSTEMATIC LIST:—

Residents : Little Grebe, Cormorant, North American Ruddy Duck, Mute Swan, Partridge, Moorhen, Coot, Common Snipe, Great Black-backed Gull, Herring Gull, Black-headed Gull, Woodpigeon, Skylark, Jackdaw, Magpie, Jay, Great Tit, Blue Tit, Coal Tit, Marsh Tit, Nuthatch, Mistle Thrush, Song Thrush, Blackbird, Robin, Hedge Sparrow, Meadow Pipit, Pied Wagtail, Grey Wagtail, Starling, Greenfinch, Goldfinch, Chaffinch, Yellow Bunting, Reed Bunting, House Sparrow.

Summer or Winter Visitors and Passage Migrants : Ringed Plover, Common Sandpiper, Lesser Black-backed Gull, Turtle Dove, Swift, Swallow, Wheatear, Redstart, Sedge Warbler, Garden Warbler, Whitethroat, Lesser Whitethroat, Willow Warbler, Spotted Flycatcher, White Wagtail, Yellow Wagtail.

LEPIDOPTERA NOTES BRISTOL DISTRICT, 1964

BUTTERFLIES

By J. F. Burton

An encouraging number of records were again sent in by local naturalists: 24 contributed compared with 18 in 1963. I hope that this total may be further increased next year; all records are welcome even for the commonest species. The area covered by this report consists roughly of Gloucestershire south of a line from Slimbridge to Tetbury, and Somerset north of the Parrett Estuary and the Polden Hills; a very few records for localities just outside these boundaries are also given.

1964 was a good year for butterflies over most of Britain, especially in the south, and this was reflected in our area. Several species showed signs of recovery and migrants were much more in evidence. Better weather conditions were presumably largely responsible, but a general recovery may be occurring, as happened several times in the past 200 years after lean periods. Such fluctuations have been correlated with significant climatic changes and since, apparently, we are now returning to the climate which prevailed in Britain prior to 1850 it is particularly important to study insect population changes. The continued destruction of habitat is, however, a real threat to the recovery of those local species with specialized requirements such as the Adonis Blue.

All records received for 1964 are given, except for commoner species where information is summarized. Contributors were : R. Angles (R.A.), C. S. H. Blathwayt (C.S.H.B.), J. F. Burton (J.F.B.), Mr. & Mrs. G. Buxton (G. & S.B.), E. Clay (E.C.), Miss A. M. Clough (A.M.C.), J. E. Cooper (J.E.C.), J. Cowley (J.C.), H. H. Davis (H.H.D.), R. Dobson (R.D.), A. Drake (A.D.), R. A. England (R.A.E.), M. Kendall (M.K.), Miss Marjorie Knight (M.Kt.), H. W. Neal (H.W.N.), Mrs. B. J. Pitt (B.J.P.), K. H. Poole (K.H.P.), M. A. Silcocks (M.A.S.), T. B. Silcocks (T.B.S.), Dr. D. A. Stopher (D.A.S.), Dr. & Mrs. R. Warin (R.W.) and T. R. J. Williams (T.R.J.W.). **G.** refers to Gloucestershire, **S.** to Somerset. All notes are of adult insects unless otherwise stated.

Pararge aegeria Linn. (Speckled Wood)

This species enjoyed a much better year than in 1963 and reports indicate that it was generally common in most suitable localities around Bristol and indeed within the city boundaries themselves : e.g., on Clifton and Durdham Downs. The earliest report was of one at Goblin Combe, **S.**, on April 30 (J.C.). The first part of the first generation evidently appeared in good numbers at the end of April and early May, while a second peak of emergences about mid-June presumably represented the second part of the first generation. The first part of the second generation appeared in force in early August and the species remained abundant until mid-September ; a peak at the end of August probably indicated the main emergence of the second part of the brood. Numbers steadily decreased from mid-September, but stragglers occurred in early October, the last one being recorded at Blagdon Lake, **S.**, on the 17th by M.K.

G. Apart from Clifton and Durdham Downs, Bristol, where it was numerous in July and August, reports were received from Charfield and Filton.

S. Common in its usual haunts throughout north Somerset ; reports from Leigh Woods, Abbots Leigh, Ham Green, Pill, Portishead, Clapton-in-Gordano (Westpark Wood), Cadbury Camp, Kenn, Nailsea, Congresbury (Urchin Wood), Goblin Combe, Blagdon, Ubley, Weston Woods, Worlebury Hill, Brean Down, Banwell Wood, Lox Yeo River valley, Axbridge Hill, Shute Shelve, Dolebury Camp, Cheddar, Shipham, Ivythorn Hill, Catcott and Meare Heaths.

Pararge megera Linn. (Wall Brown)

Quite numerous in 1964, although the first brood was less plentiful than the second.

G. Durdham Down, Bristol : one, July 1 (J.F.B.) ; Charfield : one, Sept. 4 (M.Kt.).

S. Cadbury Camp : one, Aug. 2 and 27, 4 on Aug. 28 (E.C.) ; Broadfield Farm Combe: 2-3, Aug. 23; Burrington Combe: one, Aug. 23 (J.F.B.); Axbridge Hill: one, Aug. 25 (K.H.P.); Crook Peak: a few, May 17 (D.A.S.), one, Aug. 26 (J.C.); Yeo estuary: one, Aug. 25 (E.C.); Sand Point: one, Aug. 30 (R.A.); Worle: plentiful, July 4; Worlebury Hill: one, July 13 (K.H.P.); Weston-s-Mare : one male, May 20 and Aug. 30 (K.H.P.); Brean Down: one in early June, several on Aug. 12 and 16, one on Aug. 20, quite common on Aug. 22, 3 on Aug. 29 (R.A., J.C., T.R.J.W.); Hythe Moor, nr. Cheddar: one, Aug. 21; Meare Heath: one male, Aug. 21 (J.F.B.); Huntspill: 2, Aug. 22 (R.A.).

Melanargia galathea Linn. (Marbled White)

Apparently continuing to maintain its numbers where its favoured haunts remain unspoilt. Records of this species would be particularly welcomed in future years, so that its true status may be ascertained.

G. Kingsweston Down, Bristol: a few, July 27 (D.A.S.); Boxwell: common, Aug. 3; Michael Wood, nr. Stone: 2, July 7 (M.Kt.).

S. West Hill, nr. Wraxall: 2-3, July 19; nr. Cadbury Camp: 5, July 27, 2 on July 28, one on July 30 and Aug. 2 (E.C.); Clapton-in-Gordano: one by Westpark Wood, July 24 (H.H.D.); nr. Clevedon: common, July 12 (D.A.S.); Sand Point: noted, July 3 and 12 (R.A.); Worlebury Hill: reported by schoolboys (K.H.P.); Brean Down: common in early July (T.R.J.W.), noted, July 26 (R.A.); Shipham: 2, July 5 (G. & S.B.); Blagdon Lake: 4, Aug. 1 (M.K.); Walton Heath: a few, July 19 (D.A.S.).

Eumenis semele Linn. (Grayling)

S. Cadbury Camp: one, Aug. 27 (E.C.); Sand Point: 6+, July 26, noted, Aug. 9 (R.A.); Brean Down: very common in July, smaller numbers throughout August, one on Sept. 1 (T.R.J.W.), one, July 26, 6+, Aug. 16 (R.A.), *c.* 6, Aug. 20 (J.C.); Crook Peak: 2, Aug. 26 (J.C.); Dolebury Warren: 6, Aug. 22 (E.C.); Charterhouse: fairly common, Aug. 15 (D.A.S.); Velvet Bottom, nr. Charterhouse: common, Aug. 22 (D.A.S.), several, Aug. 23 (J.F.B.); Draycott: fairly common, July 26 (D.A.S.).

Maniola tithonus Linn. (Hedge Brown)

Fairly common in suitable habitats around Bristol.

G. Kingsweston Down, Bristol: fairly common, July 25 (D.A.S.); Clifton Down, Bristol: one female, Aug. 4 (J.F.B.).

S. Ashton Park, nr. Bristol: plentiful, July (J.E.C.); Leigh Woods: plentiful, July (J.E.C.), 2, Aug. 23 (J.F.B.); Abbots Leigh: one male, Aug. 6; Ham Green: one, Aug. 22; Pill, one, Aug. 3 (J.F.B.); Portishead: many around the power station, July 31 (H.H.D.); Cadbury Camp: very common in July and August, one, Sept. 12 (E.C.); Blagdon Lake: abundant in one area on N.W. shore, Aug. 1, 2 at Water Mint, Aug. 23 and another, Aug. 29 (M.K.); Sand Point: one, Aug. 9 (R.A.); Brean Down: several, July 18, Aug. 12 and 22, one, Aug. 30 (T.R.J.W.); Walton Heath: fairly common, July 19 (D.A.S.).

Maniola jurtina Linn. (Meadow Brown)

G. and **S.** Records indicated that *jurtina* was generally common around Bristol from mid-June to mid-September. The earliest reported was one on Worlebury Hill, **S.**, on June 12 (K.H.P.) and the latest, two on Green Down, Charlton Mackrell, **S.**, on Sept. 29 (J.C.).

Coenonympha pamphilus Linn. (Small Heath)

Although locally plentiful, several reports suggest that *pamphilus* is surprisingly scarce in some districts. All records are given below:

G. Filton: 2, Aug. 20, one, Aug. 28 (R.A.).

S. Leigh Woods: one, June 28—only one seen in 1964 (J.E.C.); Cadbury Camp: fairly common in a limited area (E.C.); Weston Moor: one, May 17 (J.F.B.); Sand Point: 12, Aug. 30 (R.A.); Worlebury Hill: 3 on the golf-links, June 12; Weston-s-Mare: noted, Sept. 7 (K.H.P.); Brean Down: very common in July, small numbers present throughout August and a few on Sept. 12 and 26 (T.R.J.W.), one, Aug. 16 (R.A.), several, Aug. 20 (J.C.); Crook Peak: several, Aug. 26 (J.C.); Axbridge Hill: noted, Aug. 25 (K.H.P.); Dolebury Warren: one, Aug. 21 (E.C.); Velvet Bottom, nr. Charterhouse: a few on Aug. 22 (D.A.S.) and 23 (J.F.B.); Huntspill: 2, Aug. 22 (R.A.); Walton Hill, nr. Street: several, Aug. 21 (J.F.B.); Windmill Hill, nr. Street: fairly common (G. & S.B.); Charlton Mackrell: 3 on Green Down, Sept. 27 (J.C.).

Aphantopus hyperanthus Linn. (Ringlet)

The small numbers of reports received suggest that the Ringlet was plentiful in many places in north Somerset. Again no records from **G.**

S. Clapton-in-Gordano: "usually noted in Westpark Wood, but scarce or absent in 1964" (H.H.D.); Cadbury Camp: common (E.C.); nr. Clevedon: fairly common, July 12 (D.A.S.); Wrington: 2, July 31 (M.K.); Weston Woods: noted July 15 and Aug. 9 (R.A.); Worlebury Hill: 10 seen in an hour in the woods, July 13 (K.H.P.); Walton Heath: fairly common, July 19 (D.A.S.); Meare Heath: 6 fresh imagines, July 4; Shapwick Heath: several, July 18 (J.F.B., M.K.).

Argynnis euphrosyne Linn. (Pearl-bordered Fritillary)

S. Cadbury Camp: one in June (E.C.); Walton Heath: fairly common, May 16 (D.A.S.).

Argynnis aglaia Linn. (Dark-green Fritillary)

S. Nr. Cadbury Camp: one, July 27 and 30 (E.C.); nr. Clevedon: common, July 12—at least 20 seen in the afternoon (D.A.S.); Brean Down: 8, July 5, 13 on July 13, 7 on July 19, plentiful on July 25, one, July 26 and 2, Aug. 4 (R.A., T.R.J.W.).

Argynnis paphia Linn. (Silver-washed Fritillary)

G. Kingsweston Down, Bristol: one, July 25 (D.A.S.).

S. Cadbury Camp: common in July and one, apparently freshly emerged, on Sept. 12 (E.C.); Clapton-in-Gordano: one, Aug. 3 (H.H.D.).

Euphydryas aurinia Rott. (Marsh Fritillary)

S. Nr. Charterhouse: larvae fairly common, March 27 (D.A.S.).

Vanessa atalanta Linn. (Red Admiral)

G. and **S.** 1964 was a good year for migrant Lepidoptera generally and, in common with the rest of England, *atalanta* became widespread and numerous in the Bristol area in late summer and autumn. Apart from two reported "in the spring" at Cadbury Camp, **S.**, (E.C.), the first report of a wave of immigrants was of about 50 each of *atalanta* and *Vanessa cardui* massed on the summit of Crook Peak, near Compton Bishop, **S.**, on June 18 (R.W.). Many of these butterflies were seen chasing each other. A rather worn and tattered imago seen at Pill, **S.**, on June 27 (J.F.B.) was also presumed to be an immigrant. The offspring of these immigrants began to emerge in the latter half of July, and in August and September were seen even in Bristol itself. Numbers dwindled by mid-October and the last ones were seen at Brean Down, on Oct. 25 (T.B.S.) and Cadbury Camp, **S.**, on Nov. 1 (E.C.).

Vanessa cardui Linn. (Painted Lady)

G. and **S.** This immigrant species was commoner in 1964 than it has been for several years. The first immigrants apparently reached north Somerset at the end of May as one was seen at Brean Down on the 26th (R.A.) and another at Yatton on the 27th (H.H.D.); the main wave, however, did not arrive until mid-June when Dr. & Mrs. Warin saw about 50 on Crook Peak (see under *atalanta*) and H. H. Davis saw several in the moors near Yatton. Their offspring began to appear at the end of July and became fairly common in August and September; the last one seen was at Blagdon on Oct. 17 (M.K.). Reports were received from the following localities:

G. Bristol, Charfield and Chalford.

S. Cadbury Camp, Walton-in-Gordano, Nailsea, Yatton, Weston-s-Mare, Brean Down, Uphill, Crook Peak, Blagdon Lake, Chew Valley lake, Shipham, Ebbor, Steart Point, Westhay (one larva on *Cirsium arvense* Aug. 21), Catcott Heath and Creech St. Michael.

Aglais urticae Linn. (Small Tortoiseshell)

G. and **S.** Much commoner than in 1963. After hibernation, it was fairly plentiful, the first imagines being seen at Filton (**G.**) on March 13 (R.A.) and at Weston-s-Mare (**S.**) on March 25 (K.H.P.). The first generation, which appeared in late June and early July, was common and gave rise to a large second generation; this began to appear in mid-August, reaching a peak in the second and third weeks of September. On Sept. 12, for example, M.K. counted 150 visiting the flowers of Water Mint on the N.E. shore of Blagdon Lake (**S.**) and found it abundant on visits around this date. Other observers reported between 20 and 40 in quite small areas (*e.g.*, gardens) at this time. Many larvae were seen as late as Aug. 22 at Cadbury Camp (**S.**) by J.F.B. and this suggests that the September peak numbers of imagines may have been due to the emergence of a third generation. Numbers declined rapidly during the second week of October and almost none were left by the end of the month, although R.A. saw one on Nov. 1 at Sand Point (**S.**).

Nymphalis io Linn. (Peacock)

G. and **S.** Commoner than last year. The first imagines out of hibernation were seen at Westpark Wood, Clapton-in-Gordano (**S.**), on March 13 and 27 (H.H.D.), and throughout April and May small numbers were on the wing. Larvae were reported in plenty from Abbots Leigh (**S.**) on June 28 (J.E.C.), the Avon Gorge on July 2 (K.H.P.), Stoke Moor, Draycott (**S.**), on July 4 (T.B.S.) and Meare Heath (**S.**) on the same date (J.F.B.). The first butterflies of the summer generation appeared in the first week of August and the species became fairly common until the latter half of September when numbers declined. Stragglers not yet in hibernation were seen nevertheless during early October; the last record was of one at Chew Valley Lake (**S.**) on Oct. 31 (R.A.).

Polygonia c-album Linn. (Comma)

G. and **S.** The first Comma seen in the spring after hibernation was at Weston-s-Mare on April 5 (R.A.) and a few others were recorded during the rest of April and the first half of May. The first generation began to emerge in early July—the earliest reported being one in the Avon Gorge on July 2 (K.H.P.)—and remained on the wing until early August. In mid August the second generation appeared and was reported, usually in ones and twos, from several localities up to early October. The last one was seen at Cadbury Camp on Nov. 1 (E.C.). In 1964 the Comma seems to have been widespread and fairly plentiful in the Bristol district. Reports were received from the following localities:

G. Filton, Henleaze (Bristol), Sea Mills (Bristol), and Charfield.

S. Avon Gorge, Pill (including 3 on Sept. 27), Clapton-in-Gordano, Cadbury Camp (including 3–6 on several dates between Sept. 13 and Oct. 3), Goblin Combe (including 5, Sept. 19), Wrington, Chew Valley Lake, Blagdon Lake (including 3, Sept. 20), Velvet Bottom, nr. Charterhouse, Shipham, Weston-s-Mare and Weston Wood.

Hamearis lucina Linn. (Duke of Burgundy Fritillary)

S. Goblin Combe: *c.* 8, May 18 (R.D., M.K.).

Cupido minimus Fuessl. (Small Blue)

S. Worlebury Hill, nr. Weston-s-Mare: one, June 12 (K.H.P.).

Aricia agestis Schiff (Brown Argus)

S. Cadbury Camp: *c.* 2 between July 22 and 30 (E.C.), 2 males on Aug. 22 (J.F.B.), 1–7 on several dates between Aug. 27 and Sept. 12 (E.C.); Shipham: one on Sept. 1 (M.A.S.); Axbridge Hill: noted, Aug. 25 (K.H.P.); Crook Peak: fairly common, May 17 (D.A.S.).

Polyommatus icarus Rott. (Common Blue)

G. and **S.** Reports indicated that *icarus* was again widely distributed in small numbers. The first brood was apparently on the wing from early May to early July, and the second from early August to mid-September. Most reports referred to late August.

Lysandra coridon Poda. (Chalkhill Blue)

S. Cadbury Camp: one worn male on Aug. 22 (J.F.B.); Worlebury Hill: reported from its usual locality by schoolboy collectors (K.H.P.); Brean Down: a few, Aug. 3, one, Aug. 4 and 16 (R.A.), *c.* 10 males, Aug. 20 (J.C.); Draycott: common, July 26 (D.A.S.); Windmill Hill, nr. Street: fairly common (G. & S.B.). Stated (C.S.H.B.) as common in its localities in north Somerset, but owing to the hot summer was on the wing for a very short time only.

Lysandra bellargus Rott. (Adonis Blue)

S. Cadbury Camp: 5 females, Aug. 28, one male, Sept. 1, one, Sept. 8, 11 and 12, 2 (male and female), Sept. 13 (E.C.).

Celastrina argiolus Linn. (Holly Blue)

Still very scarce.

G. Old Down, Tockington: one, May 9 (D.A.S.).

S. Cadbury Camp: 2, July 23 and 27, one, Aug. 27 and 30 (E.C.); Weston-s-Mare: one, April 26 (K.H.P.) and Aug. 19 (J.C.).

Lycaena phlaeas Linn. (Small Copper)

S. Apparently widely distributed in small numbers in north Somerset in 1964, but no records from **G.** Reported from the following localities: Cadbury Camp, Sand Point, Wick St. Lawrence, Brean Down, Uphill, Axbridge Hill, Shipham, Velvet Bottom, nr. Charterhouse, Westhay, Catcott and Meare Heaths, Charlton Mackrell and Windmill Hill, nr. Street. All reports refer to Aug., Sept. and Oct., the last being of one at Shipham on Oct. 17.

Callophrys rubi Linn. (Green Hairstreak)

S. Goblin Combe: noted, April 30 (J.C.), *c.* 20, May 18 (R.D., M.K.); Dolebury Warren: one, May 10 (G. & S.B.).

Thecla quercus Linn. (Purple Hairstreak)

S. Brockley Combe: one larva on oak, May 15; Worlebury Hill: one imago in the woods, July 13 (K.H.P.).

Strymonidia w-album Knoch (White-letter Hairstreak)

G. Kingsweston Down, Bristol: several, July 25 (D.A.S.).

S. Avon Gorge: groups of 3–4 at a time flying about a Wych Elm on July 2; Worlebury Hill, Weston-s-Mare: "Wych Elm beaten for larvae on May 29, but none found although a known locality" (K.H.P.).

Pieris brassicae Linn. (Large White)

G. and **S.** Both broods were common in 1964. The advance guard of the first brood was seen on April 16, although the main emergence occurred in early May; the second brood appeared at the end of July and was last seen on Oct. 17. K.H.P. reported one in his light-trap at Weston-s-Mare on the night of Aug. 5.

Pieris rapae Linn. (Small White)

G. and **S.** First seen April 10 (Weston-s-Mare); last record, Oct. 1 (Filton). This species was generally common, and often abundant, from late April to late September.

Pieris napi Linn. (Green-veined White)

G. and **S.** Both broods were locally common, being recorded from Clifton, Bristol (**G.**), Abbots Leigh, Ham Green, Pill, Cadbury Camp, Clapton-in-Gordano, Walton and Weston Moors (especially common), Nailsea, Goblin Combe, Blagdon Lake, Weston-s-Mare (Ashcombe Park and Worlebury Hill), Brean Down, Crook Peak, Westhay, Meare Heath (very common) and Wookey (**S.**). The first brood lasted from mid-April (first date: April 16, Wookey) until mid-June (late date: July 4, Meare Heath) and the second brood from early August (first date: Aug. 1, Blagdon) until mid-September (last date: Sept. 20, Blagdon).

Anthocharis cardamines Linn. (Orange-tip)

Apparently fairly common generally, although no reports from **G.** First date, April 16 (Wookey, **S.**).

S. Pill: one male, May 17, 2 (male & female), May 30 (J.F.B.); Cadbury Camp: "only a few" (E.C.); Wraxall: 2 males, April 29 (H.H.D.); Brockley Combe: 3, May 15 (K.H.P.); Goblin Combe: noted April 30 (J.C.), 2 females, May 20; Blagdon Lake: 4 males and 2 females, May 17; Ubley: one male, May 9 (M.K.); Cheddar Wood: noted, May 10 (J.C.); Shipham: 2, May 10, one, May 16 (G. & S.B.); Crook Peak: common, May 17 (D.A.S.); Ashcombe Park, Weston-s-Mare: one, May 16 (K.H.P.); Wookey: one male, April 16 (J.F.B.).

Colias croceus Fourc. (Clouded Yellow)

S. Brean Down: one, Aug. 16 & 29, Sept. 19 & 26 (T.R.J.W.), one, Sept. 20 and two, Sept. 27 (R.A.); Weston-s-Mare district: *c.* 6 seen altogether during August and September (C.S.H.B.); near Weston: one, Aug. 16 (T.R.J.W.); Worlebury Hill: reported by a schoolboy about Aug. 26 (K.H.P.); Chew Magna: one, Sept. 17 (B.J.P.); near Cheddar: one, Aug. 22; Walton Heath: one, May 16 (D.A.S.); Green Down, Charlton Mackrell: 3, Sept. 27 (J.C.).

Gonepteryx rhamni Linn. (Brimstone)

G. and **S.** Much commoner than in 1962 and 1963. The earliest report was of one on April 6. The summer brood appeared at the end of July; the last one was seen on Sept. 28.

G. Bristol: one female at Clifton, Sept. 29 (J.F.B.), one in August, Sea Mills (D.A.S.) and one, Sept. 23, Durdham Down (T.B.S.); Filton: 2, April 8 and one, Aug. 20 (R.A.).

S. Leigh Woods: several males and females, Aug. 25; Pill: 2 males, April 27 (J.F.B.); Cadbury Camp: fairly common in spring; common in late summer (E.C.); Tickenham: 2 in May (T.R.J.W.); Wraxall: one at West Hill, April 17 (H.H.D.); Blagdon Lake: one male, April 18 and 23 (M.K.); Cheddar Wood: noted, May 10 (J.C.); Stoke Moor, Draycott: one, July 25; Shipham: one, April 11 (T.B.S.); Banwell Wood: noted, May 12 (J.C.); Sand Bay: one, April 6 (H.W.N.); Brean Down: one, Aug. 8 (A.D.), one, Aug. 16 and 22 (T.R.J.W.); Steep Holm: 2, May 5 (M.K.); Wookey: several males and one female, April 16 (J.F.B.); Walton Heath: fairly common, May 16 (D.A.S.).

Erynnis tages Linn. (Dingy Skipper)

S. Walton Heath: a few, May 16 (D.A.S.).

Pyrgus malvae Linn. (Grizzled Skipper)

S. Weston Moor: 2, May 17 (J.F.B.); Brockley Combe: 6+, May 15 (K.H.P.); Goblin Combe: noted, April 30 (J.C.), one, May 18 (R.D., M.K.); Crook Peak: fairly common, May 17 (D.A.S.).

Thymelicus sylvestris Poda. (Small Skipper)

G. Michael Wood, nr. Stone: common, July 18 (M.Kt.).

S. Ashton Park: one, July 21 (H.H.D.); Pill: a few, Aug. 2 (J.F.B.); Portishead: one, July 31 (H.H.D.); Cadbury Camp: very common in July (E.C.); Blagdon Lake: 2, Aug. 1 (M.K.).

Ochlodes venata Br. & Grey (Large Skipper)

G. Durdham Down, Bristol: 2, July 1 (J.F.B.); Michael Wood, nr. Stone: common, July 18 (M.Kt.).

S. Avon Gorge: 3 on Somerset side, July 2 (K.H.P.); Pill: 9, June 21, one, June 24, *c.* 3, July 5 (J.F.B.); Cadbury Camp: one in July (E.C.); Goblin Combe: one, May 18 (R.D., M.K.); Meare Heath: several, July 4 (J.F.B., M.K.).

MOTHS

By K. H. Poole

THE year was better than recent ones for moths, though records of migrant species have been rather few. The following notes have been taken from records supplied by C. S. H. Blathwayt (C.S.H.B.), J. F. Burton (J.F.B.), E. Clay (E.C.), J. E. Cooper (J.E.C.), D. G. Gibb (D.G.G.), R. Henderson (R.H.), K.H. Poole (K.H.P.), and Dr. R. Warin (R.W.). A few contributors are indicated by name, and unless otherwise shown single specimens have been recorded. Specimens taken at light are indicated by an asterisk.

Acherontia atropos Linn. (Death's-head Hawk). Shirehampton, Sept. 10 (Master Paul Briggs, *per* P. F. Bird); Weston-s-Mare, Sept. 12 (Master N. Taylor, *per* K.H.P.).

Macroglossum stellatarum Linn. (Hummingbird Hawk). Clifton, Sept. 27 (R.W.); Steart Point, June 27 (R. Angles); Tickenham, Sept. 13 (E.C.).

Stauropus fagi Linn. (Lobster Moth). Almondsbury, June 23* (D.G.G.); Milton, Weston-s-Mare, June 13 and 29* (K.H.P.).

Clostera curtula Linn. (Chocolate Tip). Clifton, May 14* (R.H.).

Trichiura crataegi Linn. (Pale Oak Eggar). Wickwar, common on Aug. 20 and Sept. 5* (R.H.).

Bena prasinana Linn. (Green Silver Lines). Clifton, June 4, 14 & 30* (R.H.).

Cybosia mesomella Linn. (Four-dotted Footman). Cadbury Camp, Clevedon, August (E.C.); Milton, Weston-s-Mare, June 9* (K.H.P.).

Lithosia quadra Linn. (Four-spotted Footman). Bristol, July 17 (R. Hayward); Milton, Weston-s-Mare, July 15* (K.H.P.).

Eilema caniola Hb. (Hoary Footman). Clifton, July 23* (R.H.).

Apatele alni Linn. (Alder Moth). Almondsbury, 2, May 27* (D.G.G.); Clifton, June 4* (J.E.C.); Wickwar, June 9* (R.H.).

Craniophora ligustri Schiff. (Coronet). Leigh Woods, 2, July 4* (R.H.).

Actebia praecox Linn. (Portland Moth). Weston-s-Mare, Aug. 14 (C.S.H.B.).

Amathes glareosa Esp. (Autumnal Moth). Leigh Woods, Sept. 12* (R.H.).

Amathes ditrapezium Schiff. (Triple-spotted Clay). Weston-s-Mare, July 12 and 13* (C.S.H.B.).

Anaplectoides prasina Schiff. (Green Arches). Almondsbury, June 26* (D.G.G.); Weston-s-Mare, July 12 and 13* (C.S.H.B.).

Polia tincta Brahm. (Silvery Arches). Michael Wood, Damery, June 27; Almondsbury, 2, June 29* (D.G.G.).

Ceramica pisi Linn. (Broom Moth). Clifton, June 28* (R.H.); Milton, Weston-s-Mare, June 29 and July 2* (K.H.P.).

Dasypolia templi Thunb. (Brindled Ochre). Weston-s-Mare, Sept. 28* (C.S.H.B.).

Antitype chi Linn. (Grey Chi). Almondsbury, Aug. 21* (D.G.G.); Milton, Weston-s-Mare, Aug. 26* (K.H.P.).

Apamea ophiogramma Esp. (Double Lobed). Clifton, July 17* (R.H.).

Miana literosa Haw. (Rosy Minor). Clifton, Aug. 13* (R.H.).

Hydraecia paludis Tutt. (Saltern Ear). Clifton, Aug. 18* (R.H.).

Leucania conigera Schiff. (Brown-line Bright-eye). Clifton, July 20* (R.H.).

Cosmia pyralina Schiff. (Lunar-spotted Pinion). Weston-s-Mare, July 23* (C.S.H.B.); Milton, Weston-s-Mare, July 15* (K.H.P.).

Enargia palacea Esp. (Angle-striped Sallow). Almondsbury, Aug. 14* (D.G.G.).

Zenobia subtusa Schiff. (The Olive). Almondsbury, Aug. 3* (D.G.G.); Clifton, July 3 and Aug. 4* (R.H.).

Anchocelis litura (Brown-spot Pinion). Clifton, Sept. 11 and 12*; Iron Acton, Sept. 28*; Flax Bourton, Oct. 2* (R.H.).

Xylomyges conspicillaris Linn. (Silver Cloud). Almondsbury, May 27 (D.G.G.).

Pyrrhia umbra Hufn. (Bordered Sallow). Clifton, Aug. 11* (R.H.); Milton, Weston-s-Mare, June 25 and July 7* (K.H.P.).

Heliothis peltigera Schiff. (Bordered Straw). Weston-s-Mare, Aug. 15* (C.S.H.B.).

Catocala fraxini Linn. (Clifden Nonpareil). Burnham-on-Sea, Aug. 7* (John Heslop). There is only one previous record, 1880, for Somerset.

Tholomiges turfosalis Wocke. (Marsh Oblique Barred). Shapwick, July 18* (R.H.).

Acasis viretata Hb. (Yellow-barred Brindle). Clifton, Aug. 15* (R.H.).

Thera firmata Hb. (Pine Carpet). Weston-s-Mare, July 3* (C.S.H.B.); Milton, Weston-s-Mare, June 18* (K.H.P.).

Discoloxia blomeri Curt. (Blomer's Rivulet). Clifton, 4, May 30–June 6* (J.E.C.).

Eupithecia pimpinellata Hb. (Pimpinel Pug). Tickenham, Sept 13* (E.C.).

Eupithecia tripunctaria H.-S. (White-spotted Pug.) Tickenham, Sept 14* (E.C.).

Eupithecia succenturiata Linn. (Bordered Pug). Milton, Weston-s-Mare, July 17* (K.H.P.).

Nycterosea obstipata Fab. (The Gem). Weston-s-Mare, Sept. 10 and 23* (C.S.H.B.); Milton, Weston-s-Mare, Sept. 28* (K.H.P.).

Ellopia fasciaria Schiff. (Barred Red). Clifton, July 20* (R.H.).

Semiothisa liturata Cl. (Tawny-barred Angle) ab. *nigrofulvata*. Clifton, July 17* (R.H.).

Chiasmia clathrata Linn. (Latticed Heath). Weston Moor, May 17 (J.F.B.); Milton, Weston-s-Mare, July 12* (K.H.P.).

Erannis leucophaearia Schiff. (Spring Usher) ab. *marmorinaria*. Inglestone, Mar. 8 (D.G.G.).

Phigalia pedaria Fab. (Pale Brindled Beauty) ab. *monacharia*. Almondsbury, Mar. 21 (D.G.G.).

Cleora ribeata Cl. (Satin Carpet). Weston-s-Mare, July 15 and 20* (C.S.H.B.).

Hepialus fusconebulosa Deg. (Map-winged Swift). Goblin Combe, May 24 (J.F.B.).

SEDIMENTARY, TECTONIC AND SUPERFICIAL STRUCTURES, AND IRON MINERALIZATION IN THE DEVONIAN ROCKS OF THE BRENDON HILLS, WEST SOMERSET

By B. D. Webby*
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NUMEROUS examples of small-scale sedimentary, tectonic and superficial structures have been recorded during geological mapping in the Brendon Hills. In the present paper several of the more important structures are described and figured in order to amplify the generalized account of the stratigraphy and structure of the Brendon Hills (Webby, 1965), and a brief description of the iron mineralization, with an interpretation of the origin of the ores, is also presented.

I. SEDIMENTARY STRUCTURES IN THE BRENDON HILL BEDS

The Brendon Hill Beds, the middle subdivision of the Morte Slates (Webby, 1962), are a thick, rather monotonous succession of greenish-grey, grey and brownish-grey cleaved siltstones, subordinate sandstones and slates of possible Frasnian age, occupying most of the higher ground of the Brendon Hills, and reaching a thickness of about 1,500 feet. Fossils are lacking, apart from vague plant material and worm burrowings at two localities. Cross-laminated and laminated siltstone is the predominant lithology. The beds are frequently composed of interbedded sandstone and siltstone, occasionally with a siltstone unit in abrupt contact with an overlying sandstone, as seen, for example, in the disused quarry near Lumey Farm (Fig. 1).

Three main types of sedimentary structures have been observed in the Brendon Hill Beds: (1) ripple marks, (2) lamination and cross lamination, and (3) flute marks. Ripple marks occur at several localities, including a disused pit on Langham Hill, where

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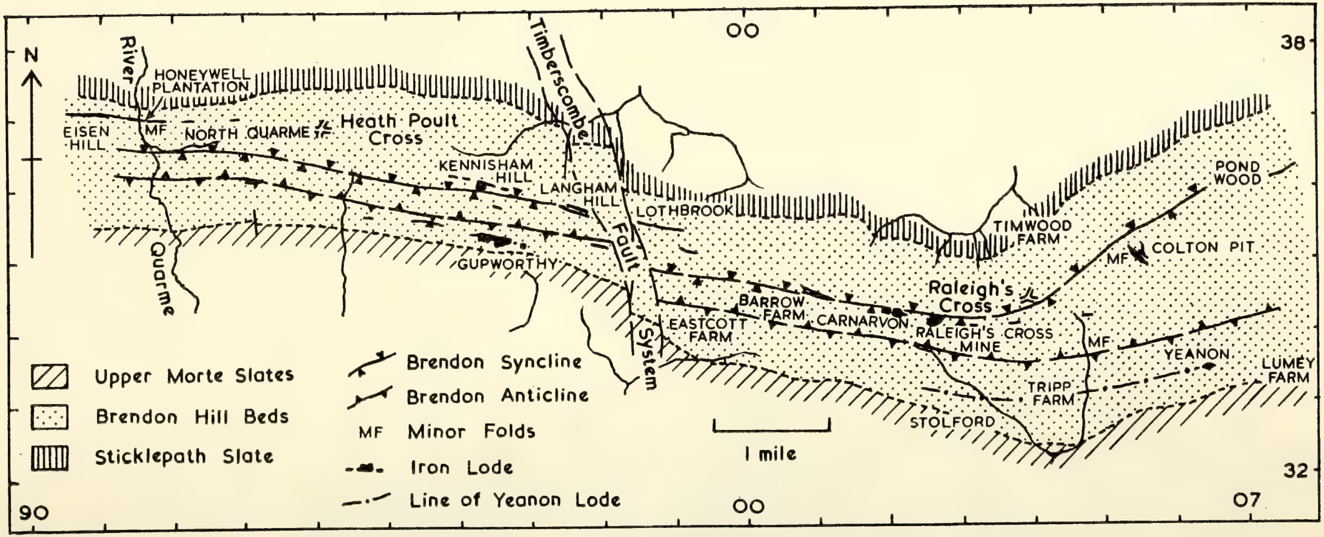

N
River
Quarme
HONEYWELL PLANTATION
EISEN HILL
MF
NORTH QUARME
Heath Poult Cross
KENNISHAM HILL
LANGHAM HILL
GUPWORTHY
Timberscombe Fault System
LOTHBROOK
TIMWOOD FARM
POND WOOD
COLTON PIT
Raleigh's Cross
BARROW FARM
EASTCOTT FARM
CARNARVON
RALEIGH'S CROSS MINE
YEANON
LUMEY FARM
TRIPP FARM
STOLFORD
I mile
90
00
00
38
32
07
Upper Morte Slates
Brendon Hill Beds
Sticklepath Slate
Brendon Syncline
Brendon Anticline
MF Minor Folds
Iron Lode
Line of Yeanon Lode

FIG. 1. *Geological map of the Brendon Hills showing the distribution of the Brendon Hill Beds and the relationship between the cleavage folds and the iron lodes.*

a steeply-inclined bedding surface is seen to be covered with current ripple marks (Plate 1,c), varying in form from symmetrical to slightly asymmetrical and occasionally intersecting one another. They have been slightly modified by tectonic deformation causing the amplitude to be heightened. A lineation produced by intersection of cleavage planes and bedding is oblique—at approximately 10°—to the ripples. Spry (1963) has described a similar example as "distorted ripple marks".

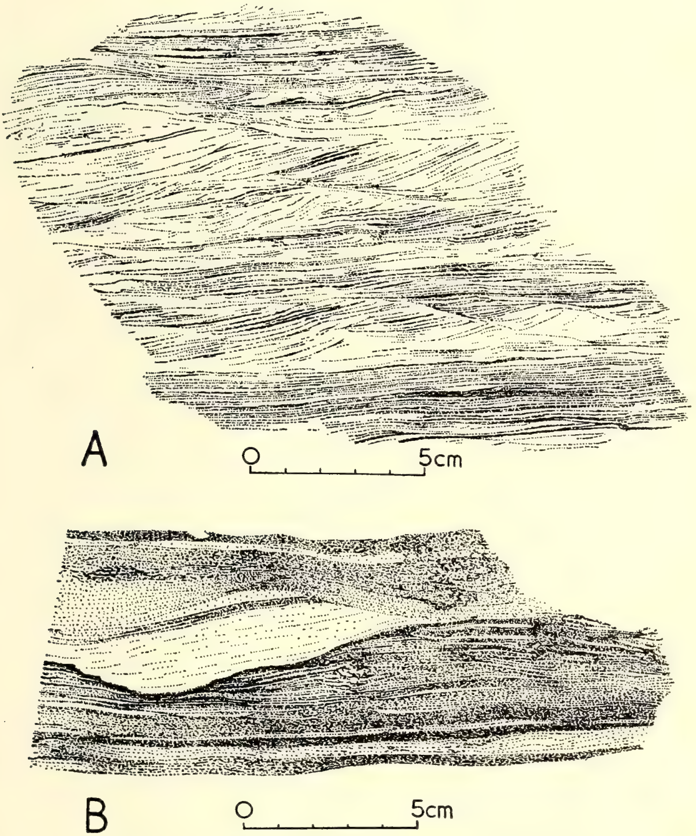


FIG. 2. A: *Light brown laminated and cross-laminated siltstone.* Drawn from a hand specimen collected on the slopes of the hill between Raleigh's Cross and Timwood Farm.

B: *Laminated siltstone enclosing a scour-and-fill lens of fine sandstone.* Patches of disturbance of lamination are mainly of tectonic origin, having been produced by intersection of cleavage planes with lamination. However, one trace of "worm" action can be seen affecting the uppermost lamination. Drawn from a hand specimen collected from a pit near Eastcott Farm.

Laminated and cross-laminated structures are the most common sedimentary features, being usually present in every exposure of siltstone. Some fine specimens of laminated and cross-laminated siltstones have been collected from loose material between Timwood Farm and Raleigh's Cross, and near Eastcott Farm. A specimen from the slopes between Timwood Farm and Raleigh's Cross shows cross lamination, probably of the ripple-drift type (Fig. 2A). In the specimen the cross-laminated siltstone alternates with bands of laminated siltstone. Another specimen from the Brendons exhibits light green laminated siltstone enclosing a scour-and-fill lens of fine sandstone (Fig. 2B).

A third type of sedimentary structure was observed on the under-surface of a sandstone in a disused quarry at the eastern end of Pond Wood. These structures are considered to be flute marks (Plate 1,a); they are aligned ESE-WNW, and suggest a westerly-directed current flow. This particular massive sandstone may have been deposited by a turbidity current, though it must be stressed that flute marks can no longer be regarded as strictly confined to turbidites (Dineley & Allen, 1960, p. 509; Pick, 1964, p. 217).

The sedimentary conditions during which the Brendon Hill Beds were laid down present something of an enigma. The thick, unfossiliferous complex consists of irregularly interbedded laminated and cross-laminated siltstones with occasional packets of slate and sandstone, and alternating, moderately evenly-bedded sandstone and siltstone. The underlying Sticklepath Slate and the

EXPLANATION OF PLATE I

(a) Sole markings, probably flute marks, on a sandstone in an old quarry at the eastern end of Pond Wood. A lineation (bedding/cleavage intersection) is developed on the bedding surface subparallel to the sole markings, and prominent knick zones almost at right angles.

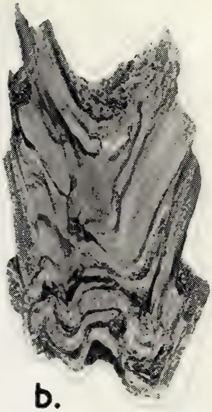
(b) Small-scale plications in laminated siltstones and silty slates (within the Roadwater Limestone) from a disused quarry south of Stowey Farm (SS949390). Two synclines and an anticline are replaced upwards by a single syncline. The laminae tend to be somewhat disrupted in the apices, and axial-plane cleavage is poorly developed. × 0.5. *E. W. Seavill, photo.*

(c) Distorted ripple marks on the base of a steeply-inclined fine sandstone in a small pit at Langham Hill. They appear to have been intensified by the deformation associated with the cleavage folding. Bedding/cleavage lineation is slightly oblique to the ripples.

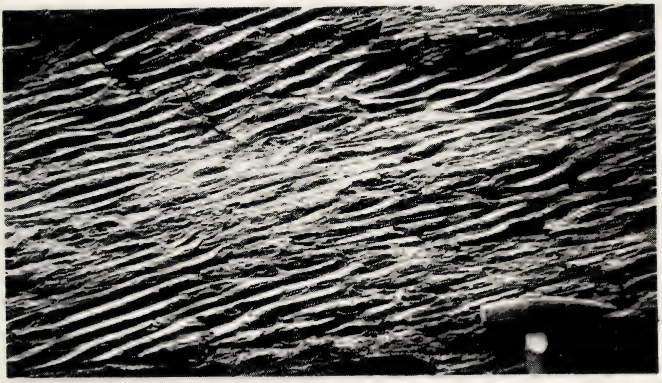
(d) Tectonic "ripple" marks on a bedding surface in the apex of a partly-exposed anticline at the old mine entrance below Honeywell Plantation.

(e) Lineations on the base of a steeply-dipping, overturned sandstone in a pit beside the Trigonometrical Point (1,127 feet) east-north-east of Couple Cross. Note also the well-developed *ac*-joints.

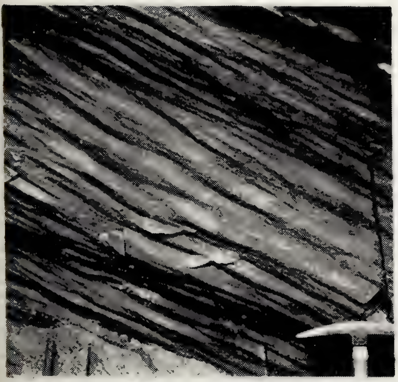
a.



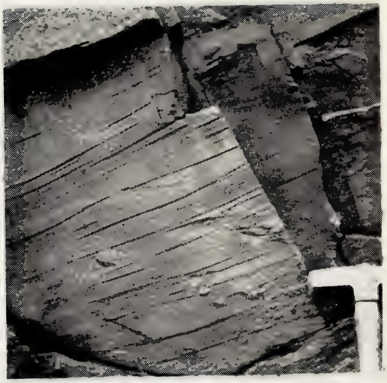
b.



c.



d.



e.

overlying Upper Morte Slates contain a few fossils which at least indicate deposition under marine conditions, but evidence for such conditions in the Brendon Hill Beds themselves is lacking. The sedimentary features give the clearest indication of the probable depositional environment. The abundance of laminated and cross-laminated siltstones and the comparative lack of disturbance of the lamination by worm burrowers suggest rather rapid sedimentation, possibly mainly by traction currents. The lack of faunas and the great thickness of beds are satisfactorily accounted for by rapid sedimentation in shallow-water conditions, possibly in a delta (Webby, 1965). The similarities between these beds and modern delta-front deposits support the existence of rather similar depositional conditions.

II. TECTONIC STRUCTURES

Cleavage folds exhibit many associated minor structures, including axial-plane cleavage, lineations and *ac*-joints (Webby, 1963; 1965). Linear structures simulating ripple marks are exposed on the flexed bedding surfaces in the apex of a minor anticline beside the cave at Oaktrow quarries (SS939401), and another occurrence of these pseudo-ripple marks is to be found in the apex of a minor anticline at the old mine entrance below Honeywell Plantation (Plate 1,d). These pseudo-ripples parallel the fold axis, plunging 30° east, and the accompanying cleavage dips 55° south.

Fine linear structures frequently occur at the intersection of cleavage and lamination, being commonly preserved in the laminated and cross-laminated siltstones of the Brendon Hill Beds, and at the intersection of cleavage and bedding in certain fine sandstones, as shown, *e.g.*, north-east of Couple Cross (SS955388) (Plate 1,e).

The pseudo-ripple marks may be considered to be weakly-developed fold-mullions, less intensely deformed than the small-scale plications found in two limestone occurrences in the Brendon Hills (Plate I,b), and known on the north Devon coastal section as "crinkled" or "wriggly" bands (Evans, 1922).

III. IRON MINERALIZATION

The iron mines of the Brendon Hills were worked intermittently from Roman times until the end of the nineteenth century. The greatest activity was between 1851 and 1883 during which period the Ebbw Vale Company raised over three quarters of a million tons of ore. Descriptions of the mines and of the nature of the iron mineralization have been given by Smyth (1859), Morgans (1868-9; 1869a; 1869b), Cantrill, Sherlock & Dewey (1919), Groves (1952), Dines (1956) and Sellick (1962). The aim of this account is to integrate these earlier observations on the iron mines with the recent geological studies in the Brendon Hills.

The lodes run approximately east-west, they are oxidized in their upper parts, and they pass down at moderate depth into siderite. Morgans (1869a; 1869b) reported that the veins of spathic ore are lenticular, mostly following the direction of the cleavage planes. The greater part of each vein is barren, and the productive pockets vary from a few yards to 200 yards long, and from a few inches to nearly 30 feet thick, but they may be more than a mile apart in the same vein. In all cases the pockets are connected by a vein-track composed of rather soft clayey-slate and quartz, occasionally with a little iron ore. The ore pockets do not descend vertically down the dip, but rake to the west or, in one or two examples, to the east. Morgans (1868-9, p. 95) advocated structural control for the origin of the ore bodies, and suggested that "the veins were formed by segregation in fissures previously existing in the clay slate rock".

The Eisen (Ison) Hill and Quarme valley lodes appear to be closely associated with the series of minor cleavage folds recognized at Honeywell Plantation (Webby, 1965). They have a similar east-west trend (Fig. 1) and the same dip as the cleavage, suggesting structural control of the mineralization.

At Raleigh's Cross, according to Smyth (1859, p. 107), the dip of the lode decreases from west to east, from 65° to 45° south. In the Colton pit the lodes dip less steeply, at 30° south-west and exhibit a south-easterly trend. Groves (1952, p. 108) thought they were branch lodes, but this seems to be erroneous. The lodes are associated with the Brendon Syncline and its accompanying minor folds, which have an E.N.E. trend and an E.S.E. plunge near Colton pit. The lodes actually trend in the same direction as the plunge of the folds, and dip in the direction of the cleavage/*ac*-joint intersection, which appears to be the same relationship as that exhibited by the lodes farther west, namely at Raleigh's Cross, Carnarvon, Barrow Farm, Langham Hill and Kennisham Hill.

Groves (1952, p. 108) indicated that the lode system from Carnarvon and Raleigh's Cross is traceable towards Yeanon. But this would require that the lodes cut obliquely across the cleavage. A more acceptable proposal would be for the Yeanon lode to trend E.N.E. in conformity with the cleavage, and then it would have a more limited lateral extent, probably westwards across Tripp Farm and north of Stolford, where two old adits have been observed.

In the mines of Kennisham Hill, Langham Hill, Gupworthy and Raleigh's Cross, the lodes rake to the west (Morgans, 1868–9, p. 91). The ore pockets have a flattened cylindrical form lying with their long axes steeply inclined to the south-west and in the plane of cleavage (Fig. 3). The lodes are clearly associated with the folds, at least the Kennisham and Langham Hill mines to the Brendon Syncline, and the Eisen Hill and Colton mines to minor folds. The long axes of the ore pockets seem to coincide with the intersections of cleavage and *ac*-joints, which may have been the most favourable sites for localization of the ore bodies in the vicinity of the hinges of cleavage folds.

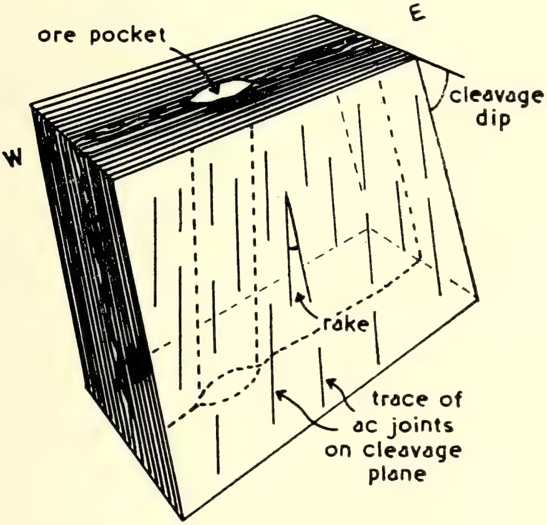


Fig. 3. *Block diagram showing the inferred relationship between the ore body and other structural features.*

Although the iron mineralization is apparently restricted to the Brendon Hill Beds, it does not seem to have formed as sedimentary ores by ferrous solutions acting on limestone bands, because none of the beds is calcareous. Ores may have been formed by ferrous solutions replacing limestones at lower structural levels, perhaps in the Ilfracombe Beds, and the mineralizing solutions then passing upwards along the apices of the folds and crystallizing out at higher levels still more or less in association with the cleavage folds.

On structural grounds it would appear that the age of the iron mineralization in the Brendon Hills immediately succeeded the cleavage folding, and pre-dated flexure folding, faulting and the deposition of the New Red Sandstone, possibly in Carboniferous-Permian times. It is certainly younger than the lead-silver mineralization at Combe Martin which has been dated by Moorbath (1962, p. 321) at 370 ± 50 million years (mean of three analyses), a late Devonian age. The mineralization at Combe Martin affects beds of the Lester Series, whose correlatives in west Somerset are considered Middle Givetian in age (Webby, 1964). The Combe Martin lead-silver mineralization seems to be confined to the north Devon area.

A third mineralization is represented in the northern part of west Somerset by a copper-barytes association in New Red Sandstone and Devonian limestones at Dodington, in the northern part of the Quantocks (Dines, 1956, pp. 770–1), in the Carboniferous Limestone at Cannington Park (Wallis, 1924) and possibly also by mineralized New Red Sandstone near Stogumber and Luccombe. This mineralization is probably Jurassic in age.

IV. SUPERFICIAL STRUCTURES

Superficial deposits mantle the valley sides and floors in the Brendon Hills and the Quantock Hills to a depth of many feet, sometimes as much as 30 feet. The deposits are mainly coarse, poorly sorted, angular, locally-derived material, which seem to have accumulated as "head" (solifluction debris) during Pleistocene periglacial conditions. The shaved bedrock surfaces so characteristic of many solifluction deposits (Cotton & Te Punga, 1955) are seldom seen: more often there is an upward gradation from undisturbed bedrock into poorly-sorted, angular, locally-derived debris.

Both Brendons and Quantocks exhibit a landscape of subdued aspect characterized by slopes that are convex near the top and concave near the bottom, a landscape which—as Te Punga (1957, p. 410) has indicated—is the result of the rapid wasting of the land surface and the transportation of the enormous quantities of material to lower levels during periglaciation. Cotton (1958, p. 133) has indicated that such smooth, coarse-textured, whale-backed relief was developed where the land surface presumably escaped dissection in the interglacial intervals, and the broad slopes became progressively smoother until eventually, in the last periglacial phase, a smooth sheet of "head" mantled the surface, instead of a corrugated surface resulting from confluent coulées.

Superficial structures have been observed at many localities in the hills, being especially common on valley slopes. They usually take the form of arched and bent slates, or crumpled, folded and broken slates, and they represent the intermediate stage between the undisturbed bedrock, and the completely comminuted superficial material. Mackintosh (1867) described several examples of arched and bent slates from west Somerset, and he introduced the name "terminal curvature" for them. In a quarry near Wiveliscombe (possibly the Oakhampton quarry; ST085301), Mackintosh recorded southerly-dipping slates which curve back towards the surface to assume a northerly dip, and are overlain by a uniform superficial deposit of reddish-loam about 2 feet thick. He referred to bent and curved slates in the railway cuttings near Raleigh's Cross on level ground at the top of the Brendon Hills which suggested that the bending took place over extensive areas on perfectly flat ground; also mentioned were large blocks of quartz, which had been transported some distance from their veins. At Gupworthy, Mackintosh recorded a very large terminal curvature exposed in a horizontal adit, affecting slates to a depth of at least 20 feet (actually nearer 15 feet). This structure was certainly correctly interpreted as a superficial fold.

Another variety of a terminal curvature has been observed in slates and silty slates in a lane section at Luxborough (SS974379). The cleavage in the slates dips 40° south at the northern (uphill) end of this sloping section, it increases in dip and swings over to 60–85° north, and then gradually back to 40° south at the southern end of the section. The bent slates in the middle of the section are affected to a depth of more than 9 feet below the surface.

Zig-zag folded and crumpled superficial structures are also frequently observed in the slaty strata. For example, in a small exposure behind farm buildings at North Quarme, folded and crumpled silty slates can be seen to a depth of more than 6 feet below the surface (Fig. 4a). The superficial folds are of a distinctive type, having sharply bent and broken apices, and straight, unbroken limbs.

A distinctive superficial structure was recorded by Ussher (1908, p. 80, fig. 15) from a lane cutting north-west of Shearston (ST-278312). Slates are overlain unconformably by a stream gravel of slate and siltstone fragments, and an interbedded irregular band of brown loam. On the uphill side, contorted slates abut against the gravels, and are even bent back over them. Unfortunately, only the crumpled and broken slates are now exposed in this section.

In the lane section north of Kingsbridge (SS986380) an unusual superficial structure was exposed until recently when bulldozing operations virtually destroyed it. An unbroken sequence of mauve silty slates lies on angular sandstone boulders and smaller, angular, slaty fragments, the sandstone boulders being mainly situated on the contact with the overlying slates (Fig. 4b). The unbroken

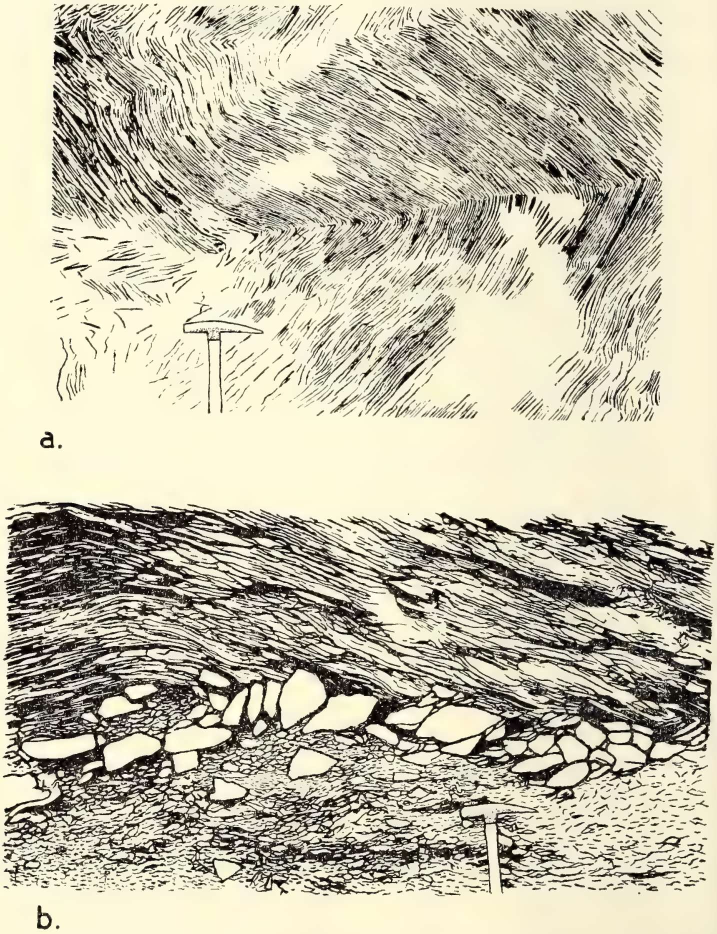


FIG. 4. a: *Superficial folding in silty slates behind farm buildings at North Quarme.* (Drawn from a photograph.)
b: *Superficial structure in a lane north of Kingsbridge, showing the unbroken slates resting on angular sandstone boulders and smaller slate fragments.* Movement of the overlying slates has been downslope from left to right (*i.e.*, from north to south). (Drawn from a photograph.)

slate mass exhibits broad undulations, but it is not noticeably crumpled or rucked even at the rather irregular contact with the sandstone boulders. Now that the section has been destroyed it is possible to see that the mauve silty slates formerly lay in direct contact upon massive sandstones, dipping south at 20°. The ground above the section slopes steeply towards the south at up to 13°. The superficial structure clearly resulted from *en masse* sliding of the slates above the massive sandstones. Once the sliding had been initiated the sandstone boulders appear to have been broken away from the underlying sandstone bed, and then acted as rollers facilitating the down-slope movement. The amount of down-hill movement is difficult to ascertain, but does not seem to have been much greater than about 25 yards. The angular slate fragments beneath the sandstone boulders are composed of the same silty slates as in the sheet above, and appear to have formed as a slide breccia by the sandstone boulders continually plucking at the underside of the sheet as it moved down hill.

None of the superficial structures can be dated with certainty, but they were formed either in Pleistocene or in more recent times, as they invariably affect the bedrock just beneath the present surface. A few of the structures, particularly those on steeper slopes, could perhaps have formed under present day conditions of landslipping after heavy rainfall, but it is difficult to visualize the numerous examples of bent, crumpled and folded slates as having a landslip origin. Their frequent association with "head" deposits, their formation on gentle slopes (*viz.*, the ground slopes at 8° at the Luxborough locality and 9° at the Gupworthy locality), and the depth to which some of the slates are affected together suggest that the majority of the structures formed in periglacial conditions within the active layer above perennially frozen ground. Spring melting produced a water-saturated active layer, which on sloping ground greatly facilitated mass movement with the development of the various types of superficial structures and solifluction deposits. On at least one occasion the active layer appears to have reached a depth of 15 feet (to account for the depth reached by the terminal curvature at Gupworthy), but more often it was probably nearer 10 feet. Re-freezing of the active layer may also have created suitable conditions for the development of superficial structures, as suggested by Bradshaw & Ingle Smith (1963). However, it seems unlikely to have been as important as spring melting, because it depends on the rather specialized conditions of re-freezing the upper surface of the active layer leaving water trapped between the surface and the permafrost beneath.

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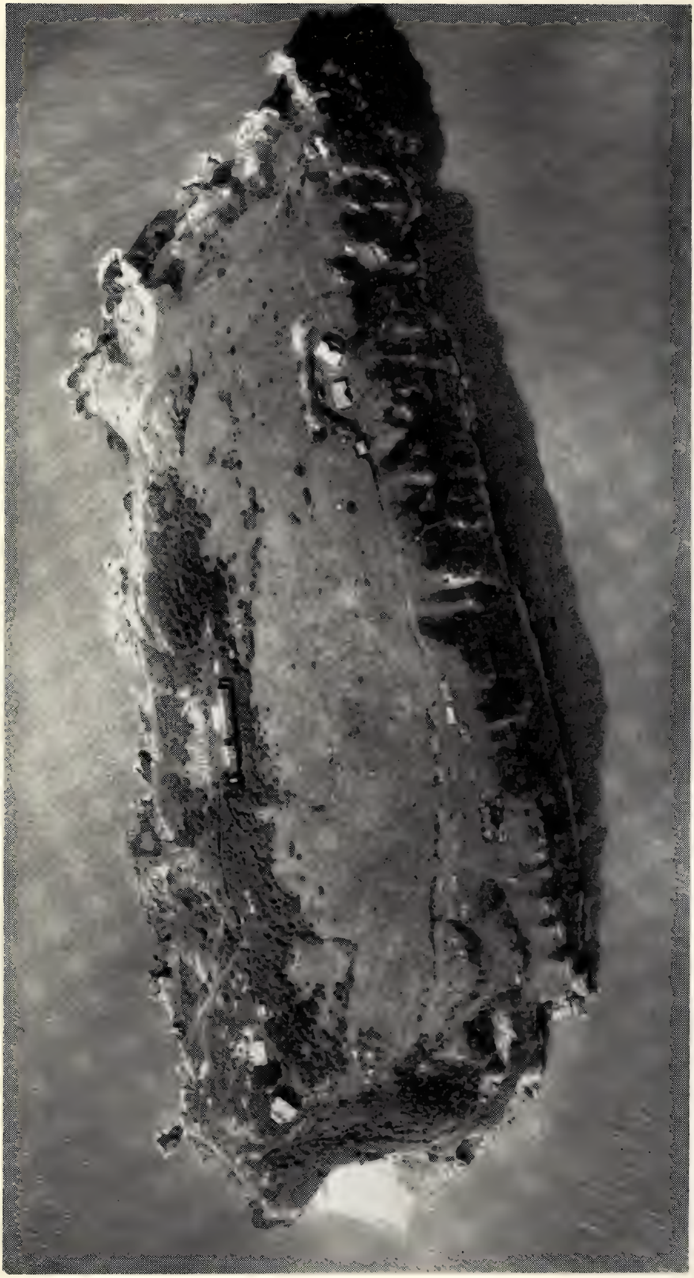

Vertical aerial photograph of Steep Holm, Som., taken in 1957. Note the bush scrub extending over the plateau from the south and east slopes.

THE STATUS OF THE DUNNOCK ON STEEP HOLM

By R. H. Poulding

INTRODUCTION

THE fauna of Steep Holm has been dominated since the beginning of this century by expanding colonies of gulls (*Larus* spp.) which in the last twenty years have covered the island. Therefore it is understandable that visiting ornithologists directed their attentions to problems associated with this unusual if not unique concentration of gulls and tended to neglect the resident passerine species. In this island habitat these are difficult to observe and are often inaudible amongst the clamour of nesting gulls. With the introduction of mist nets in 1959 for trapping migrants the number of small bird captures rose sharply and contained a high proportion of the Dunnock, *Prunella modularis* (often known as the Hedge Sparrow). The evidence from recaptures indicated that most were not passage migrants but part of a large, previously unsuspected, post-breeding season population which bore little relation to the most recent estimates of breeding pairs and their possible fecundity.

To investigate this apparent disparity and also other population problems the Dunnock has been studied since 1962 on frequent visits between April and October when the island is normally accessible. This paper is concerned with the past and present status of the species, and relates the changes of population density to alterations in the vegetation.

DESCRIPTION OF THE HABITAT

Topography

A detailed account of the physiography and geology of Steep Holm (Som.) is given by Smith (1939) but certain important features require amplification. This limestone rock (Plate II) of the Lower Carboniferous period lies in the Bristol Channel (Grid Ref. ST/228607) 3 miles W. 15° N. of Brean Down, Som., and 5 miles S.S.E. of Lavernock Point, Glam., with Flat Holm about 2 miles to the N.N.E. It is roughly elliptical in shape—950 yd. long and 350 yd. at its widest point with the long axis running east to west. The total map area is approximately 46.7 acres. On the north side there are high, almost vertical, cliffs traversed by ledges sufficiently wide to contain vegetation; the south side slopes at about 30° from a low cliff to a plateau rising from 150 ft. O.D. at

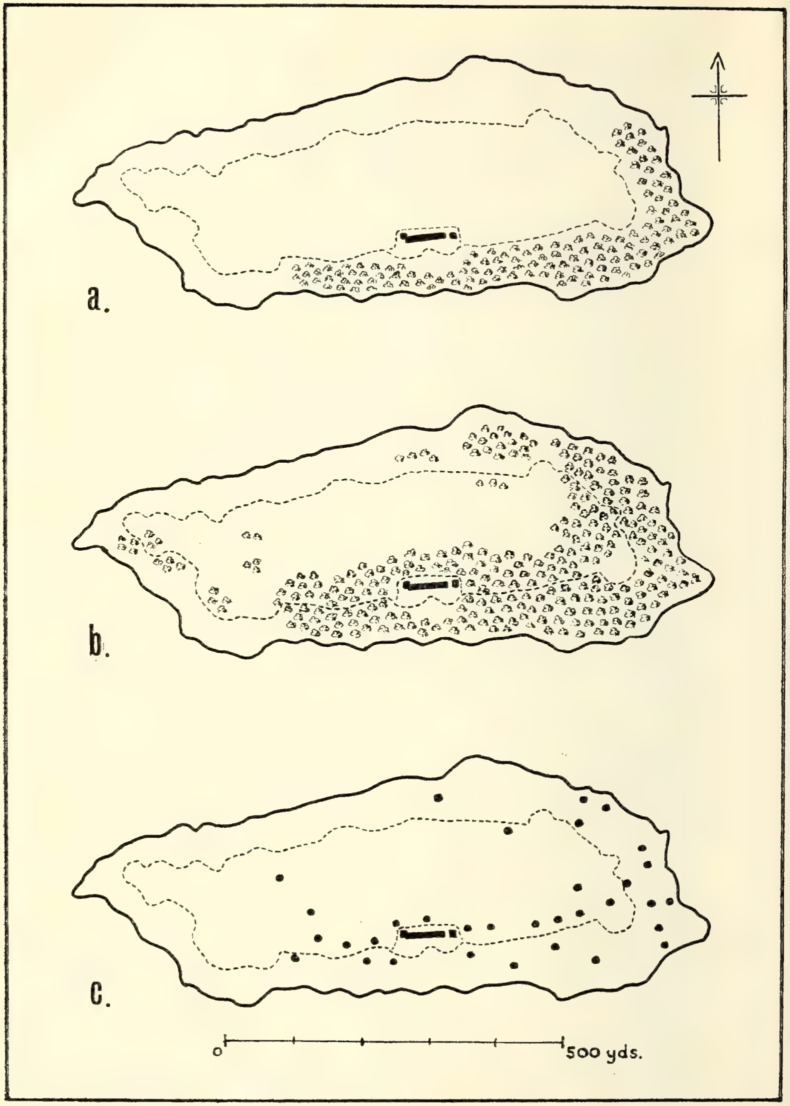

FIG. 1. *Steep Holm.*

(*a*) *Distribution of bush scrub in the 1930s.*

(*b*) *Distribution of bush scrub 1964.*

(*c*) *Distribution of Dunnock territories 1964.*

the south-west edge to a little over 250 ft. O.D. towards the north-east. This area, bounded roughly by the 150 ft. contour and approximately 22 acres in extent, is relatively smooth (apart from occasional artificial mounds or cuttings), unlike the cliffs and slopes which are intersected by boulder-covered screes and ravines.

Present Vegetation

A list of plants recorded in 1962–3 together with a distribution map of the dominant species are given by Graham (1964). The following description of the chief types of vegetation affecting the density of the Dunnock is based on this survey, and supplemented by observations made in 1964. The classification used is that suggested by Yapp (1955).

Bush Scrub

Privet, varying from 2 to 6 ft. high depending on exposure to wind, dominates the extensive low scrub zone covering approximately 15 acres or 32% of the area (Fig. 1b). It extends along the south and east sides from the cliff edge to the shoulder of the slope, over a large area of plateau adjacent to these slopes and in isolated patches at the west and north edges. At the advancing edge of this zone and along borders with paths, ravines and rock projections the privet (*Ligustrum vulgare*) is mixed with bramble (*Rubus fruticosus* agg.) forming a dense privet-bramble complex characteristic of scrub on limestone (Skene, 1939). Mature privet in the more sheltered areas of the plateau facing south consists of long, entwined branches up to 12 ft. long growing obliquely or in part horizontally with leaves only on the terminal portion to produce a thick canopy. The soil or rock beneath is frequently bare and largely free from herbaceous vegetation although wild Arum (*Arum maculatum*) is often abundant beneath gaps in the canopy. Elder (*Sambucus nigra*) is common throughout this zone but most shrubs are stunted by wind action and poor soil conditions.

Woodland Scrub

On the east slopes sheltered from the prevailing wind is the only woodland vegetation on the island, and is composed chiefly of stunted sycamore (*Acer pseudoplatanus*) up to 25 ft. high mixed with elder, privet and some blackthorn (*Prunus spinosa*). The field layer beneath the thin canopy is a carpet of wild Arum and nettles. Apart from the taller sycamores the general appearance is of bush scrub and it is included in this zone for convenience.

Field Vegetation

The area of plateau not covered with privet scrub is thickly carpeted with Alexanders (*Smyrnium olusatrum*) and Hemlock (*Conium maculatum*), with lesser amounts of Annual Nettle (*Urtica urens*) and Ragwort (*Senecio jacobaea*). Hemlock was dominant to the north and east of the plateau in 1964 while Alexanders was more prevalent to the south and west with a narrow intermediate zone where they were co-dominant. Flowering stalks of these Umbellifers may reach 6 ft. high in places by early summer, especially after a warm wet spring. Immature non-flowering plants provide a lush herbage up to 2 ft. During periods of drought with prolonged sun the *Smyrnium* zone is drastically reduced leaving the dried seed-bearing stems standing in bare soil which, after rain, is soon carpeted with a sparse ground vegetation including nettles. Alexanders also grows profusely on the cliffs wherever a foothold can be obtained. On the slopes it survives even amongst privet and bramble where these are sufficiently stunted to enable the *Smyrnium* leaves to reach adequate light.

PAST CHANGES IN THE VEGETATION

There is little precise information on the distribution of the main types of vegetation covering the island in the past despite frequent visits by botanists. The earliest reference occurs in *The Account Book of the Norton Beauchamp*, *c.* 1625, where an entry notes the absence of grass, and the abundance of privet and elder, from which Skene (1939) deduces that "the whole top of the island was under scrub". The plateau was similarly carpeted with privet when Banks and Lightfoot visited it in 1773 (Riddelsdell, 1905) although at this time Alexanders was probably extending into the scrub from the cliffs. In his *Journal* for 26 July, 1832, the Rev. John Skinner noted that an old man had been clearing for seven months "the Privet and wild carrot which now almost wholly occupy the surface".

The commencement of farming, and the garrisoning of the island by the military in 1867 almost certainly completed the removal of the scrub from the plateau for Thomas (1884) refers to the "cap of grey-green turf" and Murray (1891) recorded privet as plentiful on rocks and cliffs. The plateau was under culture until about 1923, and in 1925 the Alexanders in association with bramble and privet was still confined to the upper part of the south side (Skene, 1939). When a survey of Steep Holm was carried out by naturalists in 1938 privet-bramble scrub covered the slopes and ravines of the south side and extended to the edge of the plateau where there was a transition to a pure stand of Alexanders. Turf appeared to be limited to an area on the north side. The occupation of the island by the army, 1940–6, probably temporarily halted the advance of the privet scrub as many hutments were erected around the plateau perimeter, but since 1946 spread of scrub on the plateau has continued especially from the south and east sides.

The important facts, relevant to density changes in the Dunnock population, emerging from this historical account is that prior to 1830 the island was covered in a natural vegetation of privet scrub. Between 1867 and 1923 when the plateau was in cultivation or under pasture this scrub was confined to the southern slopes where it was probably kept in check by goats. Since cultivation ceased about 1923 the privet has increased almost without interruption over the south and east sides and on to the plateau replacing the field layer of Alexanders as it advanced.

STATUS OF THE DUNNOCK PRIOR TO 1962

Although Skinner recorded "Lark", "Thrush" and a Wheatear on his visit in July, 1832, he made no reference to the Dunnock. Knight (1902) did not include it in his list of birds "lately seen on the Holm in the early summer and believed to breed", and also the Rev. F. L. Blathwayt did not see this species in 1907 but both Blackbird and Robin were noted (his diary 18 April, 1907). In a manuscript (in the archives of the Steep Holm Trust) dated 8 Feb., 1916, and titled "Birds of Steep Holm Island" by John Sleeman the Dunnock is described as "very numerous throughout the year". The Sleeman family held the lease of the island for over twenty years and were perhaps in a better position to assess the birdlife than casual visitors. Nevertheless so many species are described as "numerous" or "many" that no reliance can be placed on the quantitative aspect of this reference to the Dunnock.

Col. Lascelles reported it as nesting in 1922 (*Rep. Somerset Birds* for that year) but the first indication of the size of the breeding population was not made until 1935 when, after a two-day visit in June, Tetley estimated that there were possibly four pairs (*Rep. Somerset Birds*, 1935). This assessment is partially confirmed by Lewis (1936) who recorded a few pairs resident, and also by Blathwayt in 1936 when he noted "several pairs about" during a visit in May. Tetley (1939) in his survey of the vertebrata lists the Dunnock under occasional visitors—birds that "have bred, but doubtfully now". This was almost certainly an oversight for they were doubtless still resident when the army took over the island in 1940 for on the last visit by the Ornithological Section of this Society in May, 1939, they were seen or heard in several areas (Davis, 1939). In the summer of 1946 when the military were still in partial occupation several pairs were observed during a single day visit by ornithologists but the first post-war survey was not made until 1949. Based on the number of singing males, Poulding (1949) recorded eleven pairs, and in the following year P. J. Chadwick estimated at least eight pairs resident (*pers. comm.*). Although no further complete census of the population was made until 1962 breeding was confirmed in most of the intervening years.

BREEDING POPULATION 1962–4

The gullery extending to every part of the island from March until early August makes the location of Dunnock pairs difficult for not only are their call notes and song drowned by the continuous cacophony of the gulls but the territorial males also tend to remain concealed even when in full song. Persistent movement of large gulls in the limited air space in and above the domiciles of the Dunnocks appears to be a deterrent to simultaneous visual advertisement during territorial song. In the autumn when the island is free from nesting gulls this concealment during territorial behaviour does not occur. The detection of nests as an indication of the size of the breeding population proved impracticable on a sample area because of the extent and density of the scrub zone.

Therefore the method finally adopted to determine exactly the number of breeding pairs was to locate every male occupying a domicile (contested area within which the breeding territory and nest is sited) by visiting repeatedly all suitable areas of the island and mapping the position of each singing bird. The approximate extent of each domicile was determined by the various song 'posts' of the male and also by the behaviour of adjacent pairs. As the census was carried out in late April or early May in each of the years 1962–64, each singing male was presumed to have a mate and the number of occupied domiciles to represent the number of breeding pairs. In 1963 a tape of a Dunnock's song played on a field tape recorder was used to stimulate males into song which enabled all areas to be checked for isolated pairs that may have been overlooked in the absence of territorial song. The results of the three spring censuses 1962–4 are given in Table I and the distribution of the territories in relation to the bush scrub zone in 1964 is shown in Fig. 1c.

The 1962 census did not include an area of the south slopes difficult of access and thickly populated with breeding gulls. In 1963 and 1964 it was found possible to survey this area with a minimum of disturbance and in both years four occupied domiciles were found. The 1962 total of 29 pairs is an amended figure to allow for this omission. The evidence of occupation of an isolated domicile on the north edge of the plateau in 1964 is based on a sight record and not on the location of a singing male. This particular area of bramble is frequented each year by a pair of Dunnocks and

TABLE I

RESULTS OF CENSUS OF BREEDING POPULATION, 1962–64

Year	Period of survey	Number of pairs
1962	Apr. 28–29	29
1963	Apr. 26–28	32
1964	May 1–6	33

although territorial behaviour was not detected at the time of the survey the domicile was certainly occupied in 1964.

DISCUSSION

During the 1930s, when Alexanders had become established on the previously cultivated plateau but before the privet-bramble scrub had extended beyond the shoulder of the slopes, the Dunnock breeding population on the evidence available did not exceed five pairs. A similar number of pairs was probably resident in the previous twenty years but precise information is lacking. Between *c.* 1939 and 1949 the population rose to 11 pairs and by 1964 to 33 pairs. This increase is directly related to the gradual extension of the scrub as the habitat reverted to its natural stable climax vegetation of privet and stunted elder.

The exact area covered by the scrub in the 1930s when the population was about five pairs is uncertain but from photographs and descriptions it appears to have covered some 5–6 acres (Fig. 1a) compared with the 1964 estimate of 15 acres. This increased acreage of scrub has not only provided additional cover for Dunnocks but a habitat more favourable than the original scrub zone confined to the south and east sides. The plateau supports a more luxuriant growth of privet and elder, and the more level surface dictates an almost horizontal dense shrub layer unlike the terraced and stunted growth on the slopes.

Privet in association with bramble is a favourite habitat for the Dunnock because it provides protective nest and roost sites whilst the scanty ground vegetation enables it, as mainly a ground feeder on insects and seeds, to obtain food in all extremes of weather. On such an exposed locality as Steep Holm, shelter in the dense scrub zone is a major factor in the successful colonisation by this species. The fact that the breeding stock was not depleted by the exceptional severe winter of 1962–3 (see Table I) confirms that the present structure of the habitat is particularly favourable for Dunnock survival.

The virtual absence of predators may be another contributory factor towards the success of this species and may diminish the chances of wide fluctuations in the breeding stock from year to year. Hawks occur only on passage and predatory rodents and cats are absent. The resident pair of Carrion Crows (*Corvus corone*) almost certainly prefer the eggs of gulls to the contents of Dunnocks' nests and cannot be considered serious predators of this species.

Unless the island comes under cultivation again, which is very unlikely, the Dunnock population will probably continue to increase as more of the habitat reverts to bush scrub suitable for the establishment of domiciles.

ACKNOWLEDGMENTS

I wish to thank Mr. E. J. Mason, Secretary of the Steep Holm Trust, and Mr. H. H. Davis for the loan of photographs; Miss V. Graham for much botanical information, and the Steep Holm Gull Research Station Committee for permission to carry out the surveys.

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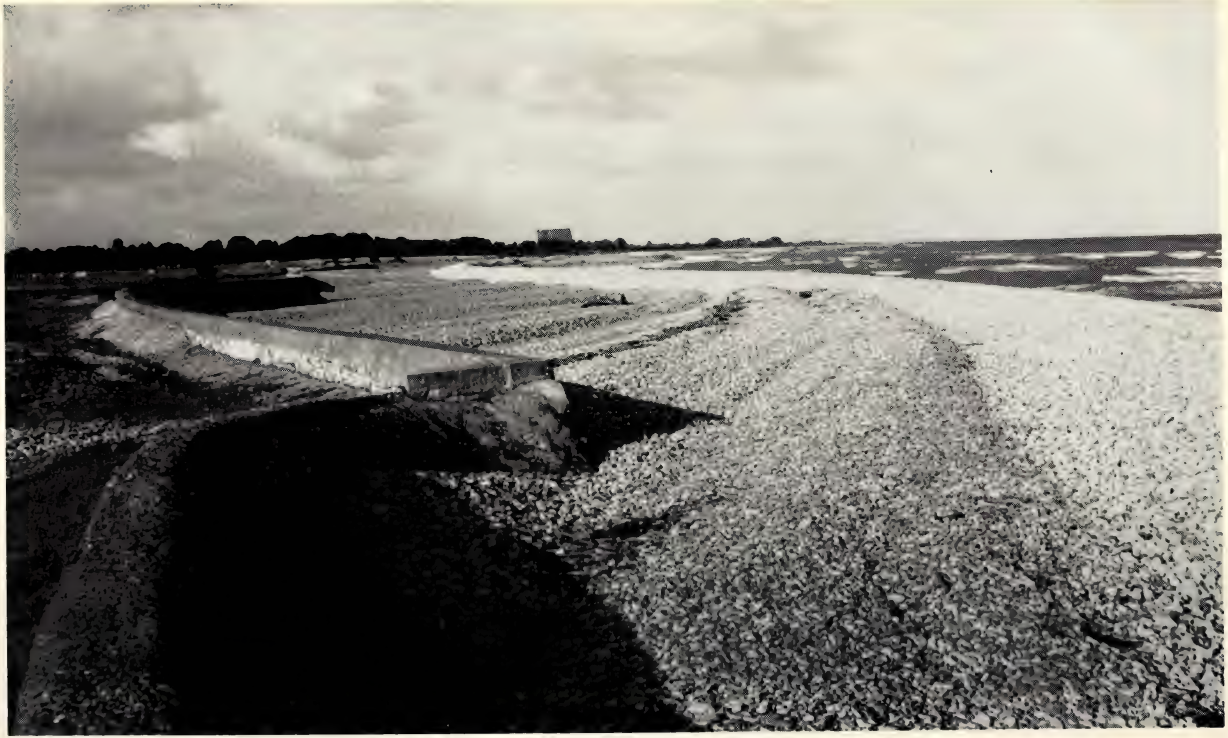


Bridgwater Bay: view from E. end of Country Sea Wall looking west. Wall was originally built because of erosion here. Shingle ridges which form part of this complex and developed later are shown. New ridges continue to be built up at the eastern end (nearest camera) while older ones to the west are truncated (November 1962).

COASTAL CHANGES AT BRIDGWATER BAY: 1956–64

By A. P. Carr

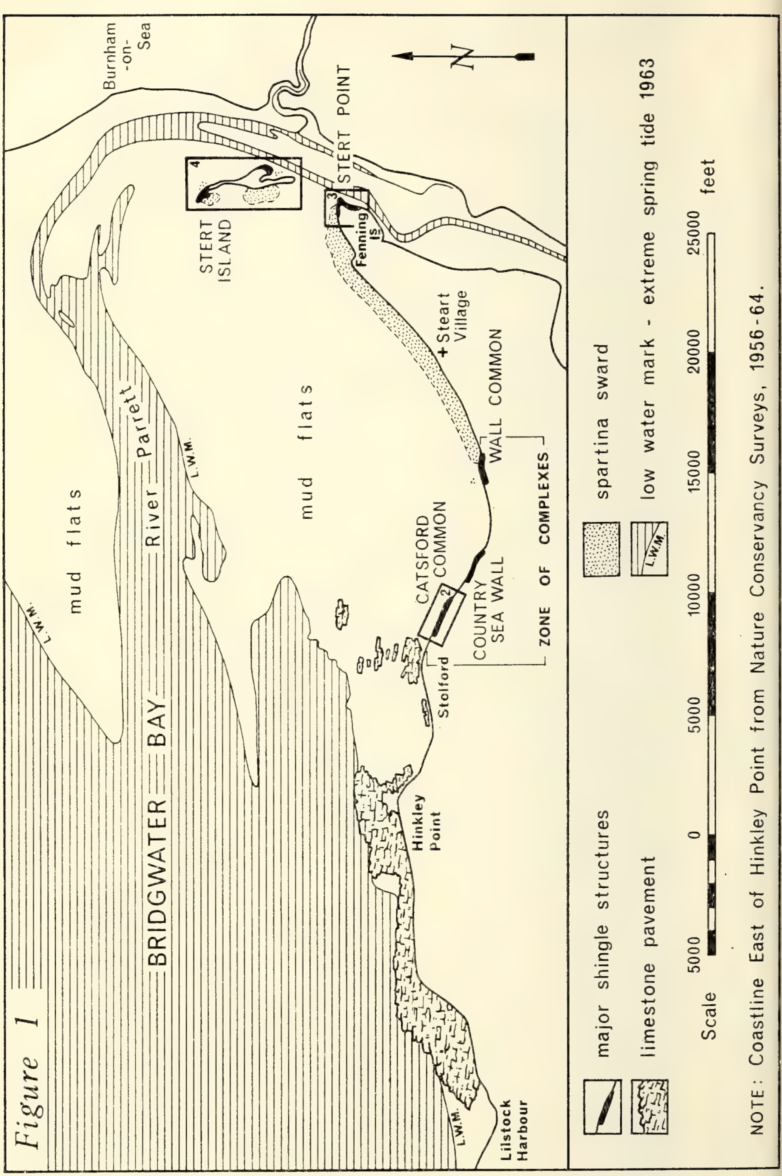
THE coast of Bridgwater Bay extends from Lilstock in the west to Stert Point and Stert Island in the east. Figure 1 shows the location of all the places mentioned in this paper. In the west the coast consists of cliffs which form ill-defined headlands and bays of Liassic limestone and shale. There, cliffs reach some 80 feet in height. In front of them is a continuous but variably-dipping limestone abrasion surface, reminiscent of an uneven pavement. To the east the coast is lower and the deposits of geologically recent age. The change is comparatively abrupt so that at Hinkley the limestone pavement and the cliffs, which by this point are only five or six feet high, both cease. There is, however, one limestone rock outcrop at Stolford. Apart from that outcrop, the area to the east of Hinkley Point is generally composed of a simple shingle storm beach fronted by extensive areas of mud flats. At Low Water Spring Tides up to three miles of these mud flats are exposed. Only in the stretch between Stolford and Wall Common are the shingle structures more complicated. This area includes the so-called 'shingle complexes' (Kidson, 1960). These are a series of ridges piled one against another (Fig. 1 shows the site of these while Fig. 2 gives a detailed example). Those ridges farthest inland are almost completely vegetated and are loosely termed 'fossil'; the remainder are bare shingle and more recent in origin.

The beach shingle, whether in the ill-defined bays of the west or in the eastern part, is derived from either the Liassic limestone cliffs and pavements or from Devonian sandstones. Likely sources of the latter occur in solifluction gravels such as those at Stolford.

Throughout at least the last 150 years the whole coastline has been subject to erosion with the single exception of the zone of complexes (Kidson, 1960). More recently, erosion has been shown (Ranwell, 1964) to have given way to accretion in the *Spartina* sward between Wall Common and Fenning Island (Fig. 1).

The tidal range at Hinkley Point reaches a maximum of 43 feet. While the base of the shingle at Lilstock is covered even at neap tides for appreciable periods, the length of time in which the shingle is subject to wave attack tends to become progressively less towards the east as far as Steart Village (Kidson, 1960). The vestiges of the shingle storm beach behind the *Spartina* sward in that area are now

Figure 1


Burnham
-on-
Sea
STERT POINT
STERT
ISLAND
4
3
Fenning
Is
N
+ Steart
Village
WALL COMMON
mud flats
mud flats
River
Parrett
L.W.M.
L.W.M.
L.W.M.
BRIDGWATER BAY
CATSFORD
COMMON
2
COUNTRY
SEA WALL
ZONE OF COMPLEXES
Stolford
Hinkley
Point
Lilstock
Harbour
major shingle structures
limestone pavement
spartina sward
low water mark - extreme spring tide 1963
L.W.M.
Scale
5000
0
5000
10000
15000
20000
25000
feet

NOTE: Coastline East of Hinkley Point from Nature Conservancy Surveys, 1956-64.

rarely reached. Wave attack increases again near Stert Point at the mouth of the River Parrett where *Spartina* is absent.

A recent paper in this Journal (Kidson & Carr, 1961) described experiments on the coast of Bridgwater Bay into the movement of marked beach material. It was shown that travel of this material was both slow and erratic, although the net movement was towards the east. In the western part of the area near Lilstock Harbour (Fig. 1) over a period of six years labelled markers virtually failed to escape from the bay in which they had been originally laid down. Further east, where the cliffs and limestone pavements give way to the shingle complexes, material travelled only towards, or to the distal (eastern) end of the shingle structure and was then thrown up above high water mark or buried. Again, in the six years during which the experiment took place only one instance of marked material travelling beyond a shingle complex was recorded. It was pointed out in the 1961 paper that a single storm coinciding with High Water Spring Tides could produce movements of the order of half-a-mile at certain sites such as Hinkley Point, and yet the maximum net travel of any marker in six years was only 7,140 feet. In the remaining sites net movement was far less. The sequence of longshore transport and subsequent removal from circulation by burial or by being thrown above high water mark was characteristic.

It is the purpose of this paper to describe the results of repetitive topographic surveys using a telescopic alidade and plane-table. These have been carried out by the Physiographical Section of the Nature Conservancy along parts of Bridgwater Bay. The changes recorded are considered in their relation to the development of the coastline, especially in the area of the shingle complexes. This series of shingle structures extends from Stolford in the west to Wall Common in the east (Fig. 1). As can be seen in Fig. 1 there are two other shingle structures, one at Stert Point and one at Stert Island. These are essentially different in their form and sequence of development and will be referred to later.

CHANGES IN THE ZONE OF COMPLEXES

As already mentioned, the main area of complexes, that which extends eastwards from Stolford, is the only part of this stretch of coast where accretion has been the dominant feature, rather than erosion, during the past 150 years (Kidson, 1960). Fig. 1 shows the position of the various complexes. High Water Springs is at about 18 feet O.D. The junction of the base of 'mobile' shingle which forms the ridges, and the 'dead' shingle and mud flats below it is at between 9 feet O.D. and 18 feet O.D., being lowest in the west of zone of complexes, and also at the western end of each individual

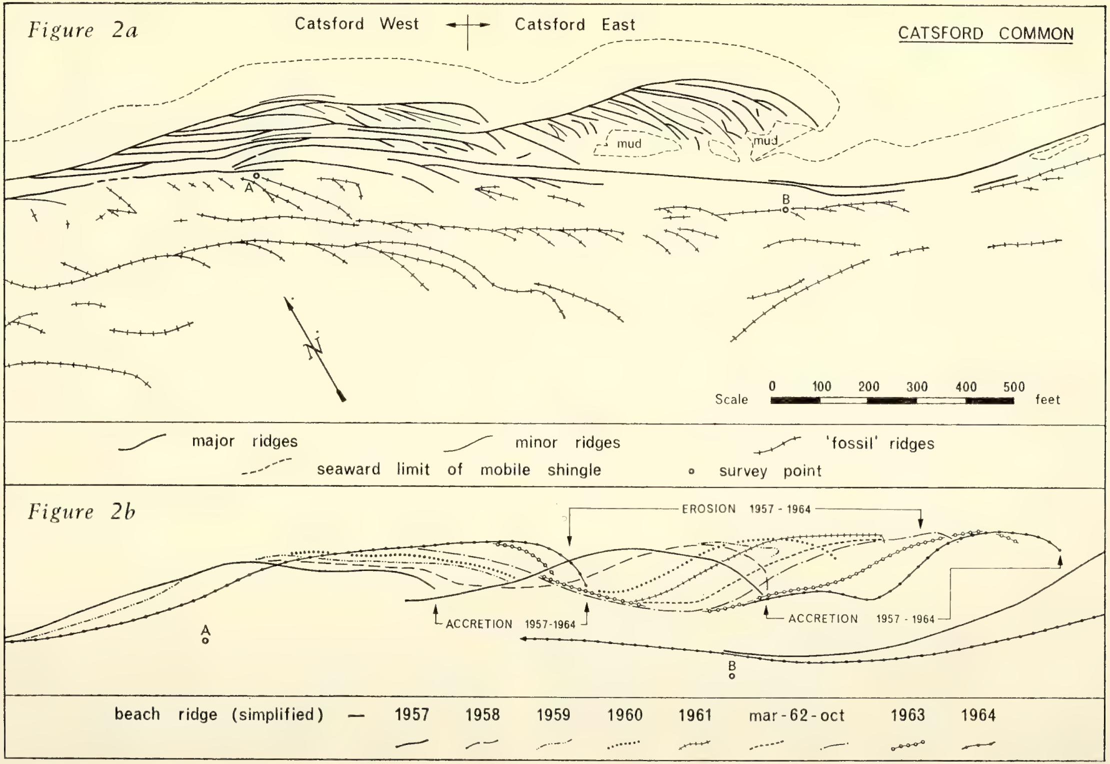


Figure 2a
Catsford West
Catsford East
CATSFORD COMMON
mud
mud
A
B
N
Scale
0
100
200
300
400
500
feet
major ridges
minor ridges
'fossil' ridges
seaward limit of mobile shingle
survey point
Figure 2b
EROSION 1957 - 1964
ACCRETION 1957-1964
ACCRETION 1957 - 1964
A
B
beach ridge (simplified) — 1957
1958
1959
1960
1961
mar-62-oct
1963
1964

FIG. 2. *Catsford Complex.*

2a. Ridge Structure: 1957.
2b. Changes in Beach Ridge: 1957–1964. The shingle beach ridges subject to wave attack for 1957 and 1964 are shown. An indication of change in the intervening years is given. The erosion represents that of the western side of the complex; the accretion is the build up between 1957 and 1964 of the eastern (distal) end

complex where erosion is at a maximum. The ridge crests vary between 19 feet and 28 feet O.D. in height. Plate III shows the complex at the eastern end of Country Sea Wall. The relationship of protective sea wall, subsequent shingle accretion as the complex migrated down coast, and finally present day erosion, is apparent. Fig. 2a gives an indication of the ridge structure of the Catsford complex and 2b shows the amount of movement of that complex towards the east between 1957 and 1964. Since the net drift of material is easterly, and since the supply of new beach material from the west is very limited, it follows that the bodily movement towards the east which is a feature of these structures is achieved only by the erosion of material at the western end, the end which is subject to attack from the direction of dominant wave approach.

Table I gives a list of the various complexes and their easterly growth between successive surveys. The figures show that between 1957 and 1964 there was a progressive decline in the total of easterly movement from 618 feet at Catsford East (Fig. 2b) to only 60 feet at Wall Common. This is a reflection of the reduction in wave energy, and of the change in the direction of wave approach as the foreshore becomes higher towards the east. Thus the most westerly shingle structures now progress down the coast at a faster rate than the almost stationary structure at Wall Common. For comparative purposes Table I also shows yearly growth of the North Weir Point shingle spit at Orford, Suffolk. There, annual extension of the spit varies but reached a maximum of 265 feet in a 12 month period between 1962 and 1963. This is an example of the rate of development where more normal hydraulic conditions prevail and some part of the beach shingle is subject to wave attack through the whole tidal cycle.

During the period of surveys at Bridgwater Bay no completely new complex has begun to develop. It would seem most probable that this would occur at the Stolford or western end of the area. This part has been disturbed by coastal defence operations which have produced an artificial beach ridge and it may be this fact which explains the lack of any new structures to be formed.

STERT POINT

The shortage of beach material, accentuated by the development of *Spartina* grass, has meant that at Stert Point there is at present no new supply of beach shingle at all. Re-sorting and re-alignment is the only process (Fig. 3). This is a response to the changing direction of wave approach as the foreshore has become higher immediately to the west. The lack of shingle has meant that the development of new recurves has become less marked even

TABLE I. BRIDGWATER BAY: *Movement in feet of distal point of shingle structure towards the East 1956–64.*

		← Zone of Shingle Complexes →							
		Catsford Common		Country Sea Wall		Wall Common	Stert Point		North Weir Point, Orford, Suffolk.
		West	East	West	East		Movement East	Max. landward recession	Growth of spit (in line R4)
	1955–56								90
	1956–57					(25)	(0)	*70*	0
	1957–58	43	36	185	98	22	22	*38*	35
	1958–59	105	34	0	−19	6	9	*0*	26
	1959–60	32	118	−34§	40	27	6	*21*	42
	1960–61	55	102	94	22	0	0	*36*	93
	1961–62	−105*	160	111†	0‡	5	8	*53*	60
	1962–63	−77*	110	33	0‡	0	3	*12*	264
	1963–64	59	58	28	0‡	0	19	*10*	134
Total	1956–64	—	—	—	—	85	67	*240*	—
	1957–64	—	618	417	141	60	67	*170*	654

* Apparent recession effect of complex being eroded along seaward face as well as at western end.
§ Effect of re-alignment and build-up immediately to west.
† Complicated by disturbance by dragline operations.

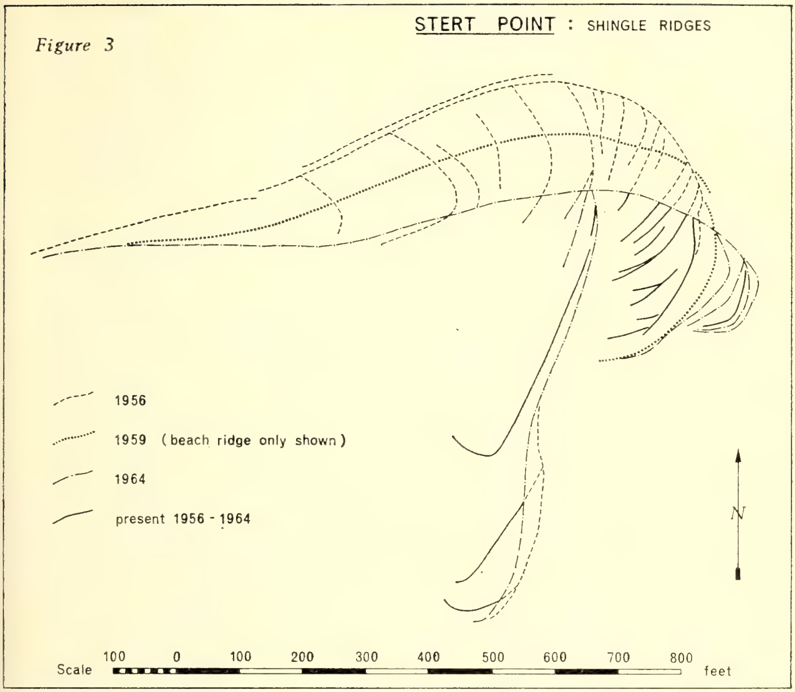


FIG. 3. *Changes at Stert Point, Fenning Island: 1956–1964.*

during the comparatively short period over which repetitive surveys have taken place. Because the Point is at the mouth of the River Parrett and because the *Spartina* sward does not extend as far east as there, wave attack is more effective than in the area just to the west. It has been possible to record erosion of up to 70 feet on the seaward face of the distal point as the result of one storm. The negligible growth of the spit towards the east and the appreciable recession landwards is indicated in Table I. Fenning Island, of which Stert Point is a part, was shown as a low area of saltings separate from the mainland in the Ordnance Survey of 1885. By 1902, the Ordnance Survey revision showed the Island joined to the mainland, and a shingle beach extending along the side exposed to the Bristol Channel. With the development of *Spartina* from about 1928 and the subsequent cessation of erosion of the foreshore at Steart Village, together with the halting of the longshore transport of material, no new shingle could reach Stert Point. Thus a gale at high tide from the northwest, for example, now pushes back the remaining shingle and exposes 'mud terraces' of the former saltings

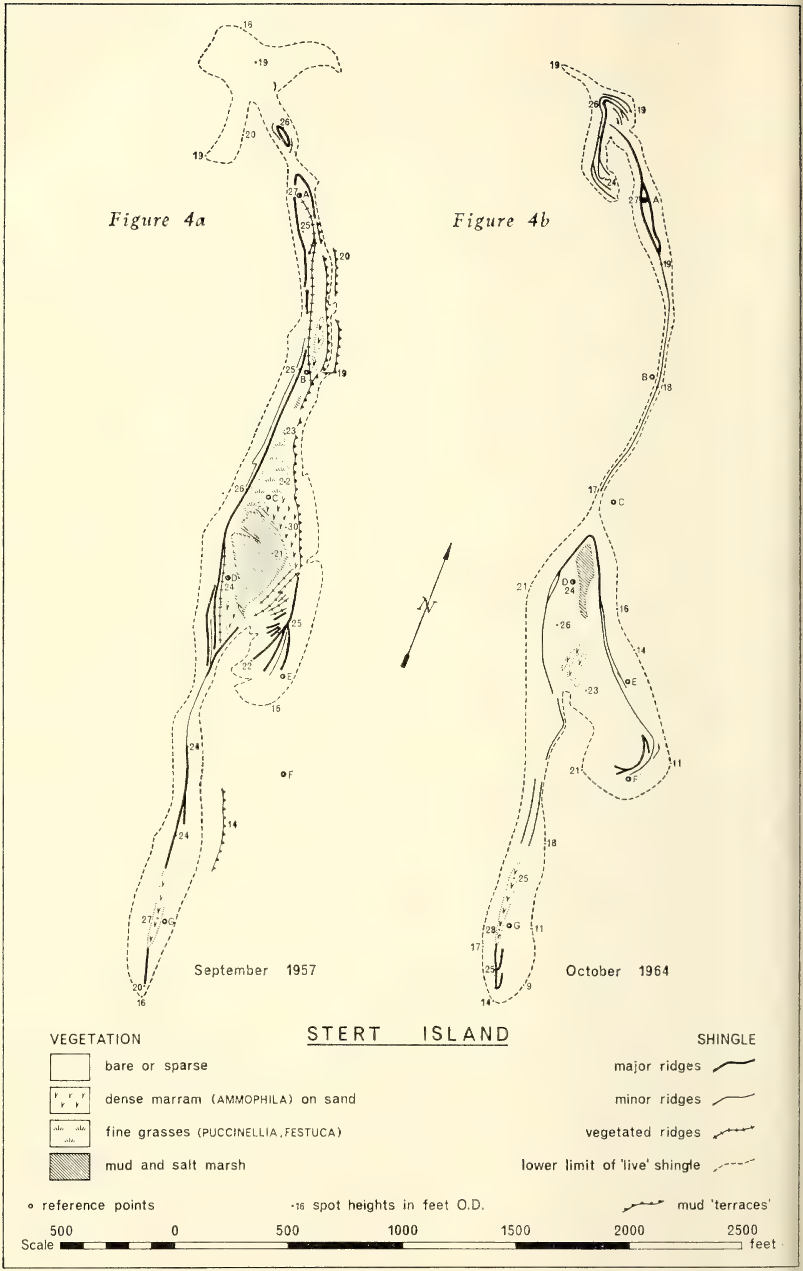


Figure 4a
Figure 4b
September 1957
October 1964
N
16
19
20
19
26
27
A
25
20
19
25
B
23
26
2·2
C
30
21
D
24
25
22
E
15
F
24
24
14
27
G
20
16
19
26
19
24
27
A
19
B
18
17
C
21
D
24
16
26
14
E
23
21
F
11
18
25
28
G
11
17
25
9
14
STERT ISLAND
VEGETATION
bare or sparse
dense marram (AMMOPHILA) on sand
fine grasses (PUCCINELLIA, FESTUCA)
mud and salt marsh
SHINGLE
major ridges
minor ridges
vegetated ridges
lower limit of 'live' shingle
reference points
·16 spot heights in feet O.D.
mud 'terraces'
Scale
500
0
500
1000
1500
2000
2500
feet

Fig. 4. *Changes at Stert Island between 1957 and 1964.*

on the seaward face. It is only at the distal point where considerable change is occurring. There is little or no erosion of the shingle storm beach of Fenning Island behind the *Spartina* sward, nor surprisingly is there any appreciable amount on the Island's eastern or southern sides where the unprotected mud cliffs are exposed to the River Parrett, and where it appears that the rate might be considerable.

STERT ISLAND

The mechanism by which Stert Island has been separated from the mainland has been shown elsewhere (Kidson, 1963). Kendall (1936, 1938) gave an indication of the changes on Stert Island just before World War II. Since 1957 annual surveys have been carried out by the Nature Conservancy. These have shown that while the Island has narrowed in width (Fig. 4) and indeed at High Water Spring Tides has been breached into two, and virtually three parts, it appears to have ceased its extension towards the north and south which was so marked a feature between 1938 and 1957. The picture is complicated to some extent by the growth of extensive areas of *Spartina* both to the west, north-west and north-east of the Island. While less vigorous than the main area near Steart Village the foreshore has risen in height to some extent here also, though most of it remains below high water mark. However, at the north end of the Island parts of the continuous area of *Spartina* are now being replaced by other plants and grasses such as *Puccinellia maritima*. These parts are now just at or above High Water Spring Tides. Further complication is produced by the over-whelming of parts of the *Spartina* sward by shingle spreads. Thus areas as much as 200 feet wide by 60 feet long have been submerged by the movement of shingle between annual surveys.

Many of the last identifiable features once present on the Island have disappeared. In the central area alone the remnants of an old brick built shelter, sand dunes above 30 feet O.D. and the last remaining extent of *Festuca* grassland have vanished. Figure 4a shows the Island in 1957 and the various major features then present, including the vegetation. Figure 4b indicates the Island in 1964. It demonstrates the narrowing of its width, the re-orientation of its central part, the comparative stability of both north and south ends, the loss of the varied types of vegetation originally present and finally the erosion and re-deposition of much of the shingle structure on the eastern side of the Island during the intervening period. It is a striking feature that most of the erosion is on the steeper eastern or landward side and not the more exposed western side, which faces the main expanse of the Bristol Channel. This is probably the result of wave refraction. Although the dominant waves approach from a westerly direction, even at high tide most of them break before reaching the shingle, sand or mud beach of the Island. This would be particularly true of the bigger storm waves. In any case while destructive waves from this direction may comb down material they are unable to transport it laterally since they break at right angles to the shore of the Island. This is not true of waves refracted round the Island's ends, which approach obliquely to the shore and work in concert with tidal flow.

CONCLUSION

In spite of the slow movement of material and the comparatively short time that waves may attack the coastline, there are, nevertheless, considerable changes on the stretch of coast extending from Stolford to Stert Island. Figure 2b has shown that between 1957 and 1964 the whole of one complex has been displaced by its own length towards the east. Because of the lack of new material and its susceptibility to wave attack landward recession of some 70 feet has been recorded at Stert Point during one gale and the whole spit there has been re-aligned. Even Stert Island itself has been reduced in width to a fraction of its size since 1957, and at times become virtually three islands. In coasts of deposition it is change, rather than its lack, which is the characteristic feature.

ACKNOWLEDGMENTS

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SUBMERGED PEAT LAYERS IN THE SEVERN CHANNEL NEAR AVONMOUTH

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In October, 1958, during the course of work on a site for the new Bristol Sewerage Treatment Plant, borings made in the alluvium bordering the Severn Estuary about one mile east of Avonmouth penetrated two layers of black peaty material. This was brought to my notice by a member of the City Engineer's Department under whose direction the programme of borings was carried out. Samples were kindly provided of both the upper and the lower peat layers from a three-inch diameter core from a ten-inch borehole made by percussion drill at a point 486 yards west of Katherine Farm. This will be referred to as Borehole 9 (National Grid Ref. ST/531796). An almost complete core of two-inch diameter was taken by rotary drill from another borehole situated 1,115 yards south-east of Borehole 9, *i.e.* further away from the present channel of the River Severn. This will be referred to as Borehole C (Grid Ref. ST/538788).

STRATIGRAPHY

The stratification recorded by the City Engineer's Department and the levels in the two boreholes are given in Table 1. The detailed examination of cores from the Lower Peat in Borehole C shows that only very thin bands of black organic material can be accurately described as peat. The greater part of the material consists of grey clay deposited under estuarine or freshwater conditions (as indicated by the presence of remains of *Phragmites communis*) and dark grey finely-bedded silt.

The black organic material is composed almost entirely of fragments of plant cuticle impregnated with a black substance, probably metallic sulphide precipitated by the hydrogen sulphide liberated in anaerobic decomposition under salt-marsh conditions.

Samples 1–5 taken in the black organic material and in the sandy clay contained insufficient pollen to provide a representative count, the most frequent pollen type observed being that of the family Chenopodiaceae. In contrast, samples from the silt (Nos. 6, 7, 8) had a high pollen content in which the abundant grains of members of the Chenopodiaceae indicate the proximity of salt marsh and those of Gramineae, Cyperaceae and the genera *Sparganium* and

TABLE I. STRATIGRAPHY

Borehole 9

Depth below surface	Height O.D.	Material
0 ft.	20 ft.	Surface
16 ft.	4 ft.	Upper Peat
16 ft. to 51 ft.	4 ft. to −31 ft.	Marine sand
51 ft.	−31 ft.	Lower Peat

Borehole C

Depth below surface	Height O.D.	Material
0 ft.	20 ft.	Surface
0 ft. to 16 ft.	20 ft. to 4 ft.	grey clay
16 ft.	4 ft.	Upper Peat about 1 ft. in thickness
16 ft. to 33 ft.	4 ft. to −13 ft.	grey clayey sand
33 ft. to 38 ft.	−13 ft. to −18 ft.	Lower Peat
38 ft.	−18 ft.	red marl (solid)

Detailed description of cores from Lower Peat (Borehole C) and position of pollen samples

Depths below O.D.	*Description of core*	*Length of core*
13 ft. 4 in.	Compact grey clay with frequent shells	6 cm.
	Dark grey laminated silt with occasional shells. Pollen samples Nos. 6, 7, 8 at 3–4 cm., 5–6 cm., 7–8 cm.	9 cm.
	Sand	1 cm.
	CORE MISSING	
8 inch core from between 15–17 ft., exact level not known	Compact grey clay with abundant *Phragmites*	20 cm.
	Black organic material Pollen sample No. 5	1 cm.
	CONTINUITY UNCERTAIN	
	Black organic material. Pollen sample No. 1	2 cm.
	Grey sandy clay becoming less sandy, with *Phragmites* leaves Pollen samples Nos. 2, 3, 4 at 1–2 cm., 4–5 cm., 6–7 cm.	8 cm.
17 ft. 6 in.	Dark grey-brown sandy clay with pebbles of red marl	6 cm.

Potamogeton suggest a freshwater flora similar to that of the "rhines" (ditches) in the vicinity at the present day. The sample of the Lower Peat from Borehole 9 also consisted of silt and contained these pollen types in approximately the same proportions.

The sample of the Upper Peat from Borehole 9 consisted of black organic material similar to that comprising samples 1 and 5 in Borehole C but with a greater pollen content which permitted a normal pollen count to be made. The sand separating the Upper from the Lower Peat has been identified as marine in origin.

POLLEN ANALYSIS

The results of pollen analysis are presented in Table 2 and in the following account they are compared with the more complete sequences available from the Somerset Levels.

The sample from the Lower Peat of Borehole 9 has an overall predominance of the thermophilous genera, *Ulmus*, *Quercus*, *Hedera* and *Corylus*, only a trace of *Alnus* and no *Fraxinus* or *Tilia*. These are all features characteristic of Zone VI. The percentage of *Ulmus* pollen exceeds that of all other trees including *Quercus*, a rather uncommon occurrence in British pollen diagrams. The possibility of differential preservation favouring the more robust pollen grains of elm cannot be altogether discounted.

Samples 6, 7, and 8 from the Lower Peat of Borehole C form a homogeneous group which differs from the sample already considered in its greater proportion of *Alnus*, in the reduced contribution of *Ulmus*, in the predominance of *Quercus* and in the additional presence of *Fraxinus* and *Tilia*. These features place samples 6, 7, 8 later in the post-glacial vegetation sequence than the sample from the Lower Peat in Borehole 9 and prove that this layer is not everywhere of the same age. In western Britain the proportion of alder pollen rises gradually from about the commencement of Zone VII(a) and values of 15–20% may persist throughout the Atlantic period as in the diagram D.B.3 from Shapwick Heath, Somerset (Godwin, 1956, p. 41) or, more usually, only during the earlier part of this period as at Toll Gate House, Somerset (Godwin, 1960). The pollen spectrum of samples 6, 7, 8, therefore, may be most closely equated with the early part of Zone VII(a).

The sample of the Upper Peat from Borehole 9 exhibits a greatly diminished proportion of *Ulmus* pollen which characterizes this spectrum as Zone VII(b) or later. The still high percentage of *Tilia cordata* pollen makes it likely that the sample precedes the horizon marked by the sudden reduction of *Tilia* pollen, well shown in the diagram from Vipers Trackway, Somerset (Godwin, 1960) and this would place the sample early in Zone VII(b).

TABLE 2. TABLE OF POLLEN ANALYSES

	Borehole 9 Lower Peat	Borehole C Sample No. 8	Borehole C Sample No. 7	Borehole C Sample No. 6	Borehole 9 Upper Peat
Betula	8%	5	5	7	2
Pinus	6	2	5	5	8
Ulmus	45	27	26	26	6
Quercus	33	53	48	45	54
Alnus	2	11	10	13	15
Tilia cordata	—	—	3	2	14
Fraxinus	—	3	3	3	—
Corylus	65	117	87	145	22
Hedera	1	1	1	2	—
Salix	—	3	1	5	1
Gramineae	17	21	25	17	46
Cyperaceae	—	6	3	3	5
Chenopodiaceae	*	23	23	19	256
Compositae	—	—	—	*	21
Sparganium	3	3	3	5	1
Althaea officinalis	—	—	—	—	7
Potamogeton	—	—	—	*	—
Polypodium vulgare	2	1	1	1	10
Pteridium	1	—	*	2	1
Ophioglossum	—	—	—	*	—
Filicales	4	—	*	3	9

The figures in the above table are percentages of total tree pollen, based on a sum of 150 grains in each sample. This sum includes grains of the tree genera listed in the first section of the table. * indicates values less than 1%.

Substantial representation of *Tilia* pollen followed by a sudden reduction was recorded also at East Moors, Cardiff (Hyde, 1936) at 6 ft. above O.D. The possibility that selective preservation may operate in favour of *Tilia* pollen (Godwin, 1956, p. 97) should be kept in mind especially when, as at East Moors, percentages are extremely high, but there is no need to infer the operation of this factor in the present case. The flora of non-woody plants represented in this sample consists mainly of the families Chenopodiaceae, Gramineae and Compositae whose presence in salt marsh communities is to be expected. Genera characteristic of early agricultural activity, such as *Artemisia*, *Plantago*, *Rumex*, are lacking and although this might indicate nothing more than the absence of farming settlements in the vicinity of the site, it might be regarded alternatively as supporting evidence for placing this sample early in Zone VII(b). *Althaea officinalis* was recorded to the extent of 7% of the tree pollen total in the sample from the Upper Peat of Borehole 9. Previous pollen records of this plant exist for sites at Burnham-on-Sea, Somerset, and Moss Lake, Liverpool, both of which refer to Zone VII(a) (Godwin, 1959).

DISCUSSION

The levels of the bedrock (Triassic red marl) underlying the Lower Peat in the two boreholes shows that the floor of the estuary slopes from −18 ft. O.D. at Borehole C to −31 ft. O.D. at Borehole 9, *i.e.* towards the present channel of the River Severn.

The Lower Peat of Zone VI age which rests on this substratum at −31 ft. O.D. was covered by marine sand representing a transgression of the sea. At −13 ft. 6 ins. (the level of the pollen samples 6, 7, 8) the peat covered by the transgression is dated as Zone VII(a), indicating that by some time early in the Atlantic period the sea level had been restored by eustatic rise to within 13 ft. 6 ins. of its present position (or more by about half the tidal range if the peat was formed at contemporary high tide level). This is closely in accordance with observations from boreholes made in the vicinity of Swansea Docks (Godwin, 1940).

The Upper Peat, recorded at 4 ft. O.D. in all the borings made by the Bristol City Engineer's Department, is dated from its pollen spectrum to early Zone VII(b) and demonstrates that by this time (if not somewhat before this) the main eustatic rise had effectively ceased. It is covered by estuarine clay related to a later marine transgression which may perhaps be correlated with that recorded in Borth Bog, Cardiganshire, the Somerset Levels and the Fenland where it is known to be contemporary with the Romano-British period (Godwin, 1956, p. 26).

The pollen-analytical evidence provides a means of relating the peat layers at Avonmouth to the chronology established by radiocarbon dating elsewhere, which has shown that the eustatic rise "was actively in progress during the Boreal period, Zones V and VI, and was fully accomplished during the Atlantic period, Zone VII(a)" (Godwin, Suggate & Willis, 1958). The Lower Peat from Borehole 9 at −31 ft. O.D., considered here to belong within

Zone VI, may be compared with a sample from Poole Harbour, Dorset (Q–181) at −42 ft. O.D. belonging to Zone VI(b) and dated at 7,340 ±110 B.C. (Godwin & Willis, 1959). It is to be noted that Poole Harbour will have been subject to a smaller tidal range than Avonmouth. The depth of the Lower Peat in Borehole C (−13 ft. to −18 ft. O.D.) approximates closely to that of a sample from Burnham-on-Sea, Somerset (Q–134) at −15 ft. O.D., likewise belonging within Zone VII(a) and dated at 4,300 ±130 B.C., which records the concluding phase of the rise in sea-level. The termination of the main eustatic rise is dated by samples (Q–120, Q–126) from Tealham Moor, Somerset, also within Zone VII(a), at about 3,500 B.C. (Godwin & Willis, 1959, 1961) which suggests that an interval unrecorded by separate deposits passed before the formation of the Upper Peat at Avonmouth which is here assigned to early in ZoneVII(b).

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OBSERVATIONS ON THE STEPPE LEMMING (*Lagurus lagurus*) IN CAPTIVITY

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THE grey or steppe lemming (*Lagurus lagurus* Pall.) is an inhabitant of Central Asia, Eastern Europe and North America, notably of the dry steppe and desert lands of these regions. A member of the family *Microtinae*, the species has been placed in the tribe Lemmini (Simpson, 1945). The adult is small and predominantly grey (but frequently of various shades, with brownish markings in older individuals) with a dark stripe down the back and a short tail. My adult specimens measured about 7.5 cm. from head to tip of tail, the tail being only 1.2 cm. long. The fur is soft and the eyes are dark. The head is rounded (as in *Microtus agrestis*).

Most of the work on this species in Britain has been done at the M.R.C. Laboratory Animals Centre in Surrey, and my specimens from this source were bred from the original stock brought from Russia by Dr. Lane-Petter. I kept twelve lemmings, mainly in successive pairs, from February 1962 to December 1964, and these notes illustrate some observations on the species, its behaviour in captivity, and its life cycle.

ACCOMMODATION

The lemmings were housed, generally as a monogamous pair, in an aquarium (2 x 1 x 1 ft.) in a cool place indoors. A smaller aquarium (15 x 9 x 9 in.) also proved successful. Sawdust was used on the floor (sometimes over newspaper). Tissue paper and soft hay supplied for bedding were soon thoroughly chewed up by the lemmings to form a soft airy mound of material. Perforated zinc gauze served as a cover for the aquarium and is probably more suitable than a more solid structure. (Work at the Surrey Centre showed a lower mortality when adequate ventilation was supplied.) Sometimes the top of the aquarium was left uncovered; the species is very limited in climbing and jumping ability.

FEEDING

Numerous foods were tried apart from the basic oats, carrot and raw beetroot suggested for my first pair. According to Ognyev (1950) *Lagurus* feeds on various wild plants including lichens

(*Parmelia* spp.), henbane (*Hyoscyamus niger*) and various grasses. Freye (1961) also fed dandelion, clover, apple and tomato. My lemmings took the following foods fairly readily:—

Raw carrot*
Mixed budgerigar seed
Raw apple*
Sunflower "seeds"*
Dry bran*
Biscuit
Banana
Crushed oats*
Wheat
Raw beetroot
Lettuce
Grasses (various)
Cornflakes
Sprouts and cabbage

* Most regularly offered foods

In common with previous experimenters I gave no water but one female lemming supplied with water for three months drank regularly and without mishap. A supply of carrot, beetroot or some other fresh food was available to each individual and none was restricted to dry bran or crushed oats. Mealworms were taken but usually without enthusiasm, the lemmings often leaving the wriggling insects and taking vegetable food instead (one female took up to six mealworms a day for several weeks, however). Other insects (*e.g.* Lepidopterous larvae, earwigs) were also tried but apparently never eaten. I also gave honeysuckle and apple twigs (*cf.* the dormouse) but again with no results. The food was placed in circular plastic dishes, with a rim to prevent the escape of mealworms. Several dishes were used to compare food preferences. The food was usually eaten whole but certain foods (*e.g.* sunflower "seeds") were invariably carried away to the nest, where their remains (fruit coats) were later found. If pieces of carrot, beetroot, etc., were small enough they too were sometimes carried elsewhere; otherwise they were eaten on the spot. Bird seed and bran were rarely carried away, the lemmings holding them in their front paws, like squirrels. Another interesting item of food was pine wood, small pieces of which the animals found amongst the sawdust. Any food left in the aquarium was removed before it went bad, especially apple. A difficulty arose here, however, since the lemmings appeared, at times, to store food. The main foods stored were apple, carrot and sunflower "seeds", small piles of these foods being found in tunnels beneath the nest box. Since storage frequently coincided with damp, oppressive weather, I wondered whether, in their natural state, they store food when conditions are unfavourable for much activity. They continued to sleep in the nest box, however, and not in the tunnels.

BEHAVIOUR AND REPRODUCTION

L. lagurus is a very active mammal but apparently solely terrestrial. Individuals will climb a piece of perforated zinc for a few inches but are incapable of jumping or climbing a smooth surface to any height. While some specimens became very tame, others remained nervous and intractable, and all continued to bolt for their nest if suddenly disturbed. The animal is a competent burrower and extensive tunnels were dug if suitable conditions were provided. My lemmings were mostly very sociable and each pair invariably slept together in the nest, often packed tightly as in a ball. Introduction of a strange individual to the cage would provoke a considerable response, however, a chase and frequently a fierce fight ensuing. Bites were inflicted and urination seemed a regular method of defence.

The animal appeared not to be strictly diurnal, often being awake and active late at night. No day-to-day routine could be detected, the times and degree of activity appearing to depend upon, *e.g.*, temperature, times of feeding. The voice is a sharp squeak but use was restricted unless excited or disturbed in some way. Youngsters gave regular "cheeps" from the nest box.

Mating is frequent and in one pair the female too attempted to mount. The male will persist in his efforts despite reluctance on the part of his mate to accept him. The recorded 20–21 days' gestation (Freye, 1961) was confirmed. The approach of term in the female is accompanied by intensive nest building and repair. In each case of successful breeding a nest box of wood or aluminium was used. All nesting material was soon transferred to the nest box and here the young were born. The male was left in with the gravid female and indeed appeared a good father, taking food to the nest. In several cases the young were destroyed by the mother however, although daily introduction of food was the sole source of human interference. The average size of a litter was three and in no case did more than this number survive to maturity. At 10–12 days of age the young may appear outside the nest (the eyes are open by 10 days) and may attempt to eat solid food. Such stray youngsters are frequently pulled back by the mother but occasionally she herself would rush quickly out from the nest, a suckling youngster being pulled out with her, on the teat. Each mother would defend the nest vigorously. The young are weaned at 17–22 days, 17 days being the earliest attempted with any of these specimens. By this age the youngster can fend for itself and feeds readily on carrot, oats and other foods. Onset of sexual activity seems to appear early—at 27 days in the case of one individual male.

An interesting litter of four was born on 24 December 1963. On 3 January, when only ten days old, they lost their mother (sudden death). I attempted to rear the young using warm cow's milk (diluted × 3) with glucose added. I also fed cod liver oil and vitamin mixtures in small doses. Despite these precautions, only one youngster survived more than a few hours, and this one for only 115 hours.

HEALTH AND DISEASE

The animal is not long lived but one specimen has survived for 19 months. The majority of the others died within a year, however. The commonest cause of death was a condition I term "lemming disease", characterized by wasting (particularly in the lumbar region) and progressive weakness. It seems not restricted to any age group and death may occur within a few hours or the lemming may survive for up to two weeks. No pathological structures were found in post mortems which were carried out whenever lemmings died. One interesting individual was an old female with an abscess on the underside, just caudal to the xiphisternum. The abscess first appeared in February 1964 and was treated with penicillin in June. It reappeared in October and on death, in November, a swab from the abscess resulted in the isolation of a Group D *Streptococcus*, a coliform and *Pasteurella*-like organism. All were susceptible to streptomycin, chloramphenicol and neomycin but all were resistant to penicillin.

SUMMARY

These notes on the Steppe Lemming provide a preliminary report on some aspects of the rodent in captivity. The small size and relative ease of handling this animal may well make it a useful newcomer to the field of medical research. Reports show that it has been used in cancer research in Russia but not in Britain. The animal appears very lively, entertaining and well worthy of the interest of the naturalist, if not the research worker.

ACKNOWLEDGMENTS

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A COELACANTH, *Macropoma*, FROM THE CHALK OF WILTSHIRE

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THE species *Macropoma mantelli* Agassiz is well known (Woodward 1891, 1911) from the Cretaceous, ranging from the Cenomanian to the Senonian, mainly from S.E. England, and this note records an example from a comparatively new exposure in the south-western region.

The specimen was found on 6 March, 1963, in a large shattered block of chalk in the Associated Portland Cement Co. Quarry, on Beggar's Knoll, near Westbury, Wiltshire (National Grid reference ST888505). The quarry is situated on the top of an escarpment. The chalk exposed here, both on the face and in shattered blocks, is greyish-white, and sometimes nodular; the nodules are occasionally green on the surface. Two minor bands of flint are also visible in the quarry face. The macrofauna found by members of the Bristol University party dated the horizon as probably Turonian, this being later confirmed by the identification of the microfauna.

The macrofaunal list is: *Ostrea* spp.; *Inoceramus* cf. *pictus* Sowerby; *Inoceramus* cf. *tenuis* Mantell; *Inoceramus lamarcki* Park (various forms); *Prionocyclus* (*Collignoniceras*) *woolgardi* (Mantell); an unidentifiable ammonite fragment; *Glomerula gordialis* Schlotheim; pycnodontid teeth; a broken tooth of a lamnoid shark; abundant fish scales; brachiopod fragments.

The microfauna comprises:

Heterohelix globulosa (Ehrenberg)	U. Cen.-?Maestr.
Globotruncana (*Globotruncana*) *arca* (Cushman)	Tur.–Maestr.
Praeglobotruncana (*Hedbergella*) spp.	L. Cret.–Maestr.
Praeglobotruncana (*Hedbergella*) *planispira* (Tappan)	L. Cret.–Maestr.
Praeglobotruncana (*Praeglobotruncana*) *stephani* (Gandolphi)	Cen.–Tur.
Chalk spheres "*Oligostegina*".	

The specimen of *Macropoma mantelli* Agassiz, Reg. No. UBGM 18386, is incompletely preserved, largely due to frost action, and to crushing which has distorted some skeletal elements. Ten pieces of the block were brought back to Bristol University and reassembled, but in order to show the specimen as clearly as possible five of the pieces had to be omitted, being facing blocks. The length of the specimen was *c.* 380 mm., but only small traces of the caudal fin remain. The posterior portion of the body is reasonably well preserved as far forward as the level of the first dorsal fin, where a large break is now filled with plaster-of-paris. This posterior region is mainly composed of well ornamented scales, very little bone structure being visible apart from the rays of the first and second dorsal fins, which are both preserved on split pieces of the original slab. The denticles present on individual fin spines are well shown. Immediately posterior to the second dorsal fin, a few of the broken basal units of the caudal fin rays are preserved. On the ventral margin, directly below the first dorsal fin, a shallow elongate depression runs posteriorly. Anterior to the fracture a similar depression with a very smooth surface is present, terminating anteriorly. The depression may represent the position of the air-sac, known in other specimens. A small, reverse block has also an elongate hollow on its inner side. The dorsal outline of the fish is well shown between the large break and the skull, where many ornamented scales are present, generally orientated in their original position. The skull is badly compressed and damaged, but the shape is well preserved, together with many internal and external skull elements. Among the bones distinguishable, despite their broken state, are: parietal, frontal, parasphenoid, pterygoquadrate, stylohyal, post-orbital, as well as an operculum in a good state of preservation, and parts of the lower jaw. The orbit is fairly well preserved, in spite of the crushed state of the whole specimen.

Maximum length (estimated)	380 mm.
Maximum depth (estimated)	100 mm.
Maximum depth of skull	83 mm.
Maximum length of skull (to rear of operculum) . .	100 mm.

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The dates given are those of election to office.

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Anyone interested in Natural History may apply to join the Society as a Full member. The annual subscription is 25/–. Members of the household of a Full member and persons residing outside a radius of twenty miles from the City Centre of Bristol may become members for an annual subscription of 12/6. There are also membership facilities for persons still undergoing educational instruction or still under the age of 21 years at the reduced subscription of 10/–. A prospectus giving fuller details of the privileges of the various classes of membership may be obtained from the Honorary Treasurer :—

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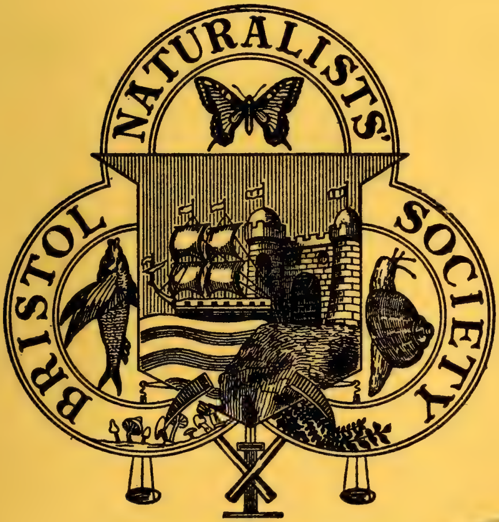
1965

PROCEEDINGS

OF THE

Bristol Naturalists' Society

EDITED BY A. J. WILLIS
ASSISTED BY A COMMITTEE



"Rerum cognoscere causas"—Virgil

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NOT LATER THAN FEB. 28.

Other instructions for authors appear on Contents page.

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2. To ensure consideration for inclusion in the next issue, contributions must be received not later than February 28.
3. All copy must be type-written (preferably double-spaced) or in very clear manuscript and, in either case, with good margins.
4. Copy submitted is not returnable and authors are advised to keep a duplicate.
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	Thearle, Mrs. R. F.	Do.
C.	Vernon, J. D. R., B.Sc., M.B.O.U.	31 Kentings, Comberton, Cambridge

REPORT OF COUNCIL
1965

MEMBERSHIP for 1965 shows an increase to 706, which includes 58 juniors. There are 16 affiliated societies.

The Annual General Meeting held on 21 January, 1965, elected Dr. A. F. Devonshire to the Presidency and other Officers and Council Members as published. The Annual Dinner, on 19 March, was again held in the Senior Common Room of the University and thanks are due to those concerned in making it the success it was.

This year was a busy one for the Society; in particular the Ornithological Section undertook to clean, sort and index the slides from the late Harry Savory. It was decided to have a continuous memorial to him in the form of additional illustrations, as required, in the PROCEEDINGS. A comprehensive questionnaire was drawn up by M. D. Kamm and circulated to all members, and the analysis and consideration of the replies led to some helpful criticism and to some changes in policy. The nucleus of a new Mammal Section has been formed and the first report on the work of the Conservation Sub-Committee and results so far achieved were given to Council. Briefly, nine areas requiring urgent consideration for conservation are being surveyed by some seven leaders with about fifteen to twenty helpers each. They hope to have preliminary reports ready soon.

It is with deep regret that we announce the deaths of the following members who in the past did such valuable work for the Society:

Miss P. M. Balch, Mrs. G. M. Boley, Miss O. M. Griffiths, Prof. K. R. L. Hall, Miss F. E. C. Long, T. H. Payne, N. Y. Sandwith.

GWYNNETH STERNE, *Hon. Secretary.*

REPORT OF ENTOMOLOGICAL SECTION
1965

THE Annual Business Meeting was held on 19 January, 1965, when the following were elected: President, Mr. K. H. Poole; Secretary, Mr. P. F. Bird; Assistant Secretary, Mr. J. E. Cooper; Committee: Mrs. A. J. Hollowell, Messrs. C. Blathwayt, J. F. Burton, D. G. Gibb, M. Kendall and N. A. Watkins. After the meeting, the City Museum's taxidermy workshop and insect collections were inspected.

During 1965 the following meetings were held:

Feb.	16:	Entomological films.
Mar.	23:	Insect Life of Fresh Water, by Mr. B. R. Baker.
July	24:	Field meeting at Meare Heath and Westhay Moor, Somerset, led by Mr. J. F. Burton.
Oct.	12:	Film *The Major*, introduced by Mr. J. F. Burton.
Oct.	21:	The Insect Fauna of Britain during the Last Hundred Thousand Years, by Dr. G. R. Coope (joint meeting with Geological Section).
Nov.	16:	Annual Exhibition at the City Museum.
Dec.	14:	Dragonflies, by Mr. A. E. Gardner.

P. F. BIRD, *Hon. Secretary.*

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31 DECEMBER, 1965

Dr.

1964 £ s. d.			£ s. d.	£ s. d.	£ s. d.
	To Members' Subscriptions:				
533 10 6	Full Members	1964	7 11 0		
		1965	574 18 0		
		1966	24 10 0		
				606 19 0	
52 10 0	" " of the same household	1965	56 5 0		
		1966	1 5 0		
				57 10 0	
15 12 6	Corresponding Members	1964	12 6		
		1965	15 0 0		
		1966	12 6		
				16 5 0	
17 0 0	Associates	1964	10 0		
		1965	15 0 0		
		1966	10 0		
				16 0 0	
13 0 0	Juniors	1965	14 2 6		
		1966	7 6		
				14 10 0	
24 0 0	Affiliated Societies	1965	24 0 0		
		1966	1 5 0		
				25 5 0	
					736 9 0
655 13 0					
	" *Proceedings* (1963 and 1964):				
	Grants, authors' contributions			64 0 0	
	Separates			27 7 9	
	Subscribers			2 2 6	
	" Sales of Publications			8 10 0	
71 9 6					
					102 0 3
					838 9 3
6 3 8	" Field Committee: surplus over expenses				12 16 9
1 15 9	" Sales of Badges				3 11 6
1 17 0	" Profit on dinner				1 1 0
3 0 6	" Interest on deposit in Post Office Savings Bank				3 2 0
14 15 4	" " " Defence Bonds and National Development Bonds				20 14 10
754 14 9					879 15 4
– – –	" Members' Contributions to "Harry Savory" Fund				31 5 8
538 5 4	" Balance from last account				645 6 4
£1,293 0 1					£1,556 7 4

P. J. M. NETHERCOTT, *Hon. Treasurer*,
10 January, 1966.

Cr.

1964 £ s. d.		£ s. d.	£ s. d.
108 6 9	By General Printing and Stationery	140 13 0	
88 10 7	" Postages and telephone	121 15 1	
15 0	" Cheque books	15 0	
12 0 0	" Clerical assistance	12 0 0	
			275 3 1
209 12 4			
313 2 8	" *Proceedings* (1964, including separates)		445 6 5
15 5 6	" Books	35 16 6	
– – –	" Bookbinding	28 0 0	
23 16 6	" Periodicals	30 9 6	
1 0	" Rent (of library room)	1 0	
4 10 9	" Fire insurance (library)	4 19 0	
			99 6 0
	" Subscriptions:		
2 10 0	Council for Nature, etc.	2 10 0	
3 4 0	South Western Naturalists' Union	3 6 0	
			5 16 0
8 11 0	" Fares and expenses of general meetings		8 10 0
– – –	" Loss on coffee service		1 7 2
67 0 0	" Grants to Sections:		
	Botanical	10 0 0	
	Entomological	10 0 0	
	Geological	15 0 0	
	Ornithological	25 0 0	
	Junior	5 0 0	
			65 0 0
647 13 9			
	" Balances to next account:		
3 0	Cash in hands of Hon. Treasurer	3 0	
73 3 9	*Cash at Bank	37 17 4	
124 9 9	Deposit in Post Office Savings Bank	127 11 9	
200 0 0	£200 5% Defence Bonds	200 0 0	
200 0 0	*£230 5% National Development Bonds	230 0 0	
47 9 10	In hands of Field Committee	60 6 7	
			655 18 8
£1,293 0 1			£1,556 7 4

*Including "Harry Savory" Fund £32 0s. 6d.

NOTE.—These accounts do not record balances held by sectional treasurers.

Audited and found correct, A. E. BILLETT, *Hon. Auditor*,
18 January, 1966

REPORT OF BOTANICAL SECTION

1965

At the Annual Business Meeting in the Small Geology Lecture Theatre of the University on 11 January, 1965, the following officers were elected: President, Dr. T. E. T. Bond; Secretary and Treasurer, Miss I. F. Gravestock; Committee: Mrs. C. H. Cummins, Dr. A. F. Devonshire, Mr. J. A. Eatough, Dr. R. M. Harley, Mrs. I. C. I. Milton, Mr. P. J. M. Nethercott and Miss A. M. Sampson.

The resignation of Mr. I. W. Evans from the office of President was accepted with regret, and a vote of thanks was passed in recognition of his lengthy service to the Section.

The Wild Plant table at the Bristol Museum continued to be much appreciated, and sincere thanks are offered to Mr. A. Warhurst and Mr. P. F. Bird of the Museum and to Mrs. G. S. Wakefield and Mr. E. S. Smith, as well as to all members who contributed specimens.

The following winter meetings were held during the year:

Jan. 11: Annual Business Meeting, followed by exhibits and short papers by Members.
Feb. 8: The Unknown Forest: a film on the New Forest.
Mar. 8: Cider Making, by Dr. F. W. Beech.
Oct. 4: Members' Evening with transparencies.
Nov. 8: A Tour of the Fruit-Growing Areas of Europe, by Eric W. Hobbis.

The following field excursions took place, under the leadership of those shown:

Apr. 24: Spaniorum Hill. Mr. P. J. M. Nethercott.
May 29: Camerton Colliery. Dr. A. F. Devonshire.
June 1: Walton-in-Gordano and Redcliff Bay. Mr. C. H. Cummins.
June 12: Windsor Hill, Shepton Mallet. Miss I. F. Gravestock. A marsh habitat was explored and also Windsor Hill quarry on the Carboniferous Limestone. *Polygonatum multiflorum* was found by the roadside as well as a hybrid garden saxifrage.
July 17: Athelney and Butleigh Moor. Mr. J. and Mrs. I. C. I. Milton. A visit to a withy-growing district, to see the crop and a demonstration of the processing. Also seen were a field of teasels (*Dipsacus fullonum* ssp. *fullonum*) grown as a crop and *Stratiotes aloides* on South Moor.
Aug. 7: Wyndcliff. Mr. P. J. M. Nethercott.
Sept. 4: Nailsea Moor. Mr. E. S. Smith.
Oct. 9: Fungus foray to Goblin Combe. Dr. T. E. T. Bond and Dr. C. E. D. Smith. A well attended meeting with prolific finds of fungi: among species seen were *Lycoperdon echinatum*, *Crucibulum vulgare*, *Geoglossum viride* and *Geastrum fimbriatum*.

I. F. GRAVESTOCK, *Hon. Secretary.*

HON. LIBRARIAN'S REPORT

1965

Exchange of publications has been discontinued with the Royal Physiographical Society of Lund, Sweden, and with the Lloyd Library and Museum, Cincinnati, Ohio. A new exchange has been arranged with the Rijksmuseum for Natural History, Leiden, Holland.

The Society purchased a number of volumes from the library of the late Mr. Noel Sandwith in addition to several new books. During the year the Library Committee co-opted Mr. and Mrs. A. E. Parslow and Mr. Julian Lovell to help with the rearranging and checking of books and with routine library matters. Much valuable work has already been done.

34 members borrowed 88 books and periodicals in 1965.

R. BRADSHAW, *Hon. Librarian.*

REPORT OF GEOLOGICAL SECTION

1965

THE Annual Business Meeting of the Section was held on 14 January, 1965 and the following officers were elected: President, Mr. R. G. Payne; Vice-President, Mr. R. Bradshaw; Hon. Secretary, Mr. M. D. Kamm; Hon. Field Secretary, Mr. D. Hamilton; Committee, Professor W. F. Whittard and the Student President of the Geological Society of the University (*ex-officio*), Mr. D. Addison, Mr. R. Ashley, Dr. J. Cowie, Professor F. Coles Phillips, Dr. R. J. G. Savage, Mr. F. Stenhouse Ross, Mr. W. Stock, Mr. D. Vowles. After the business of the meeting, the retiring president, Mr. R. Bradshaw, addressed the section on 'The Origin of the Avon Gorge,' the subject of a paper elsewhere in these PROCEEDINGS. Other lecture meetings were:

Feb. 18: Mr. T. R. Owen, Senior Lecturer in Geology, Univ. College, Swansea: the South Wales Coalfield. The speaker discussed the major folding and faulting in South Wales, the possible existence of a basin before the Coal Measures were laid down, and the origin of anthracite.

Mar. 18: Dr. F. J. W. Holwill, Royal School of Mines: Byways Among Palaeozoic Corals. Dr. Holwill described the septal development of *Metriophyllum bouchardi*, the dating of *Thamnophyllum caespitosum* by calculating the ratio of the number of septa to the diameter of the specimen, and the dating of *Metriophyllum gracile* by counting the rings on the extension to the calyx.

Oct. 21: Dr. G. R. Coope, University of Birmingham: The Insect Fauna of Britain During the Last Hundred Thousand Years. Dr. Coope indicated the abundance of fossil insect remains which he has found in the British Isles and described the present environments elsewhere in the world in which some of these species now live. From this, he suggested earlier meteorological and botanical environments for the places where the fossils were found.

Nov. 11: Mr. R. Robertson, a consultant mineralogist from Scotland: Some Experiences in Applied Mineralogy. The lecturer gave an account of his investigation of the physical properties of certain clay minerals, aided by the electron microscopy of R. Meldau in Germany. From his results, Mr. Robertson has suggested new uses for the minerals.

The following Field Meetings took place in the year:—

Apr. 3: Sharpness, Purton, and Hock Cliff, Fretherne: leader Dr. J. Cowie.

May 8: Lulworth Cove and Durdle Door: leaders Mr. D. Hamilton and Mr. R. Bradshaw.

June 12: Monk's Park Quarry, Corsham, and Brown's Folly: leader, Dr. J. Murray.

July 18: Kilmersdon Mine Tip and Knobsbury: leader Mr. I. H. Ford.

Sept. 11: Southern Malverns: leader Mr. R. Bradshaw.

M. D. KAMM, *Hon. Secretary.*

REPORT OF ORNITHOLOGICAL SECTION

1965

'THE WREN THE WREN
THE KING OF ALL BIRDS...'

At the 41st Annual Business Meeting in January, Mr. R. H. Poulding was elected President and Mr. S. M. Taylor re-elected Hon. Secretary. Messrs. K. Fox and H. W. Neal were elected to the Committee in place of Mr. J. Boswall, who resigned, and Mr. R. E. Hitchcock, who retired by seniority.

During 1965 the Section held eight indoor meetings, at which the average attendance was 88, the maximum being 134 and the minimum (as usual, for the Fieldwork Meeting) 51.

The subjects and speakers were as follows:

Jan. 13: Annual Business Meeting and films, *Journey into Spring* and *Wild Highlands*.
Feb. 12: British and European Birds of Prey, by Mr. P. J. Hayman.
Mar. 10: A Visit to Spitzbergen, 1965, by Mr. M. A. Ogilvie.
Mar. 26: Annual Fieldwork Meeting.
Sept. 22: Great Crested Grebes, by Mr. K. E. L. Simmons.
Oct. 15: Members' Evening.
Nov. 10: Woodpigeons, by Dr. R. K. Murton.
Dec. 10: Bird Protection Today, by Mr. David Lea, R.S.P.B. Reserves Manager (Joint meeting with R.S.P.B.).

Field meetings were held at Brean Down and Sand Point (Apr. 25), Kenn Moor (May 22), Inglestone Common (June 2), and the coast near Clevedon (Sept. 4). All-day visits were paid to Steep Holm Gull Research Station (May 9) and to Portland Bill and its Bird Observatory (Oct. 3). We are indebted to all who acted as leaders and co-leaders and who otherwise helped with these excursions.

During the year members of the Section supported the Nest Record Scheme, the Ringing Scheme and the Common Bird Census of the British Trust for Ornithology. Mr. B. King organised our contribution to the B.T.O.'s national Census of Great Crested Grebes in May. The breeding season survey of the local Shelduck population was continued for the eighth year under Mr. S. M. Taylor, and the enquiry into the status and distribution of birds of prey in the Bristol District entered its second year under Mr. G. Sweet.

Two new activities were begun in 1965 at the instigation of the Section's President. The first, a Survey of the Bird Population of Bristol, is under the care of a working group of Committee members headed by Miss C. Graham. It is hoped that this will provide a means whereby members living in Bristol and unable often to visit the countryside will be able to contribute to a worth-while co-operative project.

The second new activity was the formation of the Bristol Bird-ringing Group, to centralise and co-ordinate the activities of such existing ringers as care to join. Its objects are to facilitate organised and systematic ringing of special groups of birds, or in special habitats, and to improve training facilities for new recruits. The group became operational in November, and so far has seventeen trainee members. Two sites are being worked and plans for several more are well advanced.

There has been increased support in the way of contributions for the 'Recent News' items in the monthly Bulletins. We are grateful to contributors and also to Mr. M. Kendall, on whom has fallen the main burden of collecting and collating these records.

S. M. TAYLOR, *Hon. Secretary.*

ACCOUNT OF THE GENERAL MEETINGS

1965

ATTENDANCE at General Meetings continued to be good; the lecture-room was full each evening except on the one occasion when the lecturer as well as many members were prevented from attending through the onset of a blizzard.

The 102nd Annual General Meeting was held on 21 January, the Officers and Council Members for 1965 being elected with Dr. A. F. Devonshire as President. Mr. A. C. Leach was made an honorary member. The retiring President, Dr. R. J. G. Savage, then gave an address on "Animals in Prehistoric Art", pointing out how cave paintings helped to depict the evolution of animals, the type of life of the painters and also the climatic conditions prevalent. The reasons for the paintings being carried out were also examined.

On 4 Feb. Mr. R. Bassindale entertained us with an interesting talk on "Barnacles" to be found round the British Isles.

On 4 Mar. Dr. A. F. Devonshire spoke on "British Poisonous Plants" to a reduced audience of 14. Thanks are due to Dr. Devonshire for this most interesting address since the advertised speaker and most members were prevented from attending by snow.

On 7 Oct. Dr. Walker gave an illustrated talk on the "Terra Rosa and Rain Forest of Brazil". The slides used showed the justification for the name red earth around Brasilia, and the lecturer also pointed out a cause of Sahara conditions near the rain forest due to lack of mulching humus in any clearing made.

On 4 Nov. Capt. R. G. B. Roe, R.N., gave a talk on "The Changing Flora of Bath" postponed from 4 March. It was well illustrated with slides made by the speaker.

On 2 Dec. Mr. J. F. Burton spoke on "Conserving Somerset's Wild Life", an illustrated talk impressing the method of studying wild-life through ecological facts. He outlined the conservation now being undertaken by the Bristol Naturalists' Society and also the Somerset Trust for Nature Conservation.

GWYNNETH STERNE, *Hon. Secretary.*

GENERAL FIELD MEETINGS

SIXTEEN field meetings were held during the year as well as an informal walk, a Social Evening, and a new venture, a visit to Coate's Cider Factory, which was very popular. The meetings were generally well supported, and all seats were filled for the Social Evening.

A list of the meetings with dates, places visited, leaders and some indication of the main objects of interest is given below. A more complete account is kept in the records of the Field Committee.

Jan. 9: Cotswolds. Hetty Pegler's Tump and Nympsfield Barrow (Neolithic long barrows) and Uley Camp, an Iron Age (B) hill fort. Mr. A. C. K. Fear.

Feb. 21: Steart Nature Reserve (waders and other small birds) and Durleigh reservoir (water fowl)—both near Bridgwater. Mr. D. A. C. Cullen and Mr. J. Morley.

Feb. 26: Social Evening and an illustrated talk, *The Western Isles via Wester Ross*. Mr. F. R. Sterne.

Mar. 28 Ashclyst Wood, near Exeter (woodland birds and plants); Dawlish Warren (shore birds, shells, and other shore life). Mr. and Mrs. R. J. Lovell.

Apr. 16: Bredon Hill: a walk from Kemerton to the top of Bredon Hill and thence to Elmley Castle (birds, plants and deer). Mr. H. G. Hockey.

May 2: Studland (birds and plants of sand dunes and the shore); St. Alban's Head and a walk along the cliffs to Worth Matravers (sea birds, cliff plants and geology). Mr. D. A. C. Cullen.

May 13: Inglestone Common, near Wickwar (woodland birds and plants); Midger Wood, near Kilcot, where badgers were seen in the dusk. Mr. D. A. C. Cullen and Miss L. E. Hurrell.

May 19: A walk from Henbury Hill to Blaise Castle hamlet via the golf course and Blaise Castle Woods (plants and local history). Miss A. M. Sampson.

May 23: Slapton Ley Nature Reserve near Dartmouth. Here there is a fresh-water lake separated from the sea by a shingle beach (birds and plants). A family of apparently wild guinea pigs was seen. Mr. H. G. Hockey.

June 16: Blagdon Lake for water-fowl, then Burrington and a walk over the Mendips. Mr. and Mrs. R. J. Lovell.

June 20: Lee Bay, near Lynton, and the grounds of Lee Abbey (sea birds and cliff scenery). Mr. and Mrs. R. J. Lovell.

June 26: Knap Hill and Walker's Hill: joint meeting with Bath Society. Plants of the chalk and six species of orchid were seen. Mr. F. R. Sterne.

July 10: Brecon National Park. Cwm Clydach, near Brynmawr: a narrow limestone valley with a beech hanger (woodland plants, birds and geology). Llangasty-tal-y-llyn by Llangorse Lake (marsh plants and birds). Dr. A. F. Devonshire.

Aug. 14: Brean Down and Berrow (birds and plants). Miss C. Groves.

Sept. 19: Hartland Quay, North Devon (birds and geological formations, including highly folded strata and cliff waterfalls). Mr. H. G. Hockey.

Oct. 24: A walk from Midford station to Combe Hay (birds of a sheltered river valley). Mr. R. M. Curber and Mr. R. Lewis.

Nov. 13: Asham Wood and Quarries, near Frome (fungi and geology). Mr. F. R. Sterne and Mr. J. H. Kemp.

Nov. 18: Coate's Cider Factory. Mr. H. G. Hockey.

Dec. 19: Kingston Seymour, near mouth of Yeo: informal walk. Mr. and Mrs. H. G. Hockey.

A. F. DEVONSHIRE, *Hon. Field Secretary.*

ACKNOWLEDGMENT

Thanks are due to the British Broadcasting Corporation and to the Colston Research Fund Committee of the University of Bristol for grants towards the cost of publication of original papers in this issue of the PROCEEDINGS.

OBITUARIES

MRS. G. M. BOLEY

MRS. Gertrude Maud Boley, who died on 15 June, 1965, at the age of 88 years, had been a member of the Society since 1930. She was particularly active in the Botanical Section, where her main interests lay, and during the war years she addressed that Section and also contributed a notable ecological item at an Annual Exhibition.

Her husband, who died in 1945, was a prominent life member of the Society. His occupation involved the handling of cloth fabrics and Mrs. Boley's keenness as a microscopist stemmed largely from acting as his assistant at a time when the first man-made fibres were introduced. In this work she studied the structure of synthetic and natural materials microscopically.

In the Society Mrs. Boley will be remembered chiefly for her kindness and the help and encouragement which she gave to children, students and others to study plants and aspects of their behaviour in natural habitats. Particularly was she interested in gardening and tended an attractive garden at her home, Willow Cottage, Dundry.

An amateur botanist, she willingly and voluntarily assisted with University field classes when staff were short during the war, and herself studied for and passed the Intermediate examination. She worked in collaboration with members of the University Department of Botany, especially with Dr. R. Bracher and Miss J. Fraymouth, and in her studies at Berrow she was advised by Professor M. Skene. This association is evident from the acknowledgments given in the papers which Mrs. Boley contributed to these PROCEEDINGS. Her first article was on the Ecology of Dundry Down (*Proc.* for 1938), which gives much information on the composition of plant communities of the Down and ecological factors of the habitat. Later she turned her attention to the coastal region at Berrow, and mapped the vegetation of the developing salt marsh (*Proc.* for 1942), providing an important link in the botanical documentation of this changing area. A further paper concerning the sand-dune system at Berrow (*Proc.* for 1943) bears on the succession of vegetation of these N. Somerset dunes.

It is in keeping that Mrs. Boley made provision in her will not only for Missions for which she had been a voluntary worker but that she also left money to the University Department of Botany to be used partly to help needy students of exceptional promise in science.

A.J.W.

WALTER FREDERICK WHITTARD, D.Sc., F.R.S.

THE death of Professor W. F. Whittard on March 2, 1966, at the age of 63, after some months of illness, deprived the Society of a member who had been a loyal supporter since he came to Bristol in 1937 to occupy the Chaning Wills Chair of Geology at the University.

He was educated at Battersea County Secondary School, Chelsea Polytechnic, and Imperial College of Science and Technology, and later went to Sidney Sussex College, Cambridge, as a research student. From W. W. Watts he acquired a love for the Welsh Borderland region of Shropshire which became the scene of most of his earlier work. He developed a meticulous skill in mapping and acquired a wide knowledge of the stratigraphy and palaeontology of the Palaeozoic rocks of South Shropshire. He contributed to knowledge of many different fossil groups, but it was particularly on trilobites that he was internationally acknowledged as an expert. At the time of his death he was working on the final part of a monograph of the Ordovician trilobites of the Shelve Inlier published by the Palaeontographical Society. Whilst at Cambridge he was first brought into contact with another kind of geological work, arctic exploration, when he was invited to act as chief geologist to the 1929 Cambridge Expedition to East Greenland. Coming to Bristol after a few years as a lecturer at Imperial College, he was able to pass on this interest to his students and staff, several of whom have since made outstanding contributions to understanding of the geology of East Greenland.

Whittard joined the Society in 1938, and was soon actively involved in its affairs, first of all in those of the Geological Section, which he served as President from 1938 to 1940. He contributed to the *Proceedings* a series of short papers on temporary exposures in the Bristol district, including logs of boreholes which had even then been put down during preliminary exploration in connection with the proposed Severn Bridge, the completion of which is expected very shortly. As his understanding of problems of the geology of the region developed he led many field excursions, both locally to areas such as Kingsweston, Aust, or Sharpness and further afield to May Hill and the Malvern Hills. There are members of the Society who will recall the agility and speed with which they were often led over difficult terrain, but a softer note is struck in the record that on an excursion to Wickwar "the party enjoyed a pleasant surprise when they found a picnic tea kindly prepared by Mrs. Whittard and Mrs. Stanley Smith awaiting them at the end

W. F. Whittard, F.R.S.

of the afternoon". As Head of the Department of Geology he was *ex officio* a member of the Council of the Society for many years, and he also served actively on the Publications Committee. He was President of the Society in 1952 and 1953, and his retiring address on *The Enigma of the Earliest Fossils* gave a detailed account of what was then known about Pre-Cambrian organic remains and some fascinating speculations concerning the reasons why no animals with hard parts capable of fossilization appear to have existed before the Lower Cambrian. When the British Association met in Bristol in 1955, he helped as joint editor to produce the handbook *Bristol and its Adjoining Counties*.

Some ten years ago he took up with characteristic enthusiasm yet another type of research. He had been following with interest the development of techniques for exploring the geology of the sea floor by which geologists were gradually being enabled to extend their investigations from the 30 per cent. of the earth's surface occupied by land to the remaining 70 per cent. covered by the oceans. Work of this kind in the English Channel had been initiated by W. B. R. King, and on his retirement Whittard undertook to continue such explorations and to extend them through the Western Approaches towards the edge of the continental shelf. His convincing arguments for the importance of this work enabled him to obtain adequate financial support and, even more important, to secure the co-operation of the Directors of the Marine Biological Association and the National Institute of Oceanography in providing ship's time. Working with members of his staff and other interested scientists, he pursued a systematic programme of coring, dredging, and geophysical investigations which was enabling him to compile a geological map of large areas of the sea floor. In the spring of 1965 he organized at Bristol the 17th symposium of the Colston Research Society, at which a group of scientists from ten countries assembled to present papers on a wide variety of submarine studies.

Such a heavy programme of research might well have interfered with the performance of administrative duties, but Whittard served the University well in this field also. He built up a small department, with a reputation mainly in the fields of stratigraphy and palaeontology, into one well equipped to carry out teaching and research in most branches of geological enquiry. He was Dean of the Faculty of Science during the difficult post-war period 1945-48, and served on many committees of Council and Senate, particularly in relation to developments associated with the great expansion of the University in recent years. A lifelong interest was happily indulged in his Chairmanship of the Gardens Sub-Committee, and many members of the Society will be able to appreciate the evidence of his skill in this capacity shown in the gardens of the University area and the Halls of Residence.

He received many honours. In 1957 he was elected to Fellowship of the Royal Society, in 1964 to a Fellowship of Imperial College, and in 1965 was awarded the Murchison Medal of the Geological Society of London. Our Society, in common with the University, has lost a most distinguished member. He leaves a widow and an only son, to whom deep sympathy is extended.

F.C.P.

N. Y. SANDWITH

THE Society lost its most erudite field botanist and taxonomist in the death of Noel Yvri Sandwith at the age of 63 years. His sudden death at Kew on 7 May, 1965, as a result of a cerebral haemorrhage, came as a great shock to his many friends and colleagues.

Noel Sandwith was born on 8 Sept. 1901 in Nottinghamshire, and came to Bristol in the autumn of 1909 with his elder brother when his widowed mother, Mrs. C. I. Sandwith, moved here for her two sons to be educated at Clifton College. He showed an interest in plants from a very early age, and his find of *Carum carvi* by Hotwells Station is given in White's *Flora of Bristol* published in 1912. Subsequently he and his mother, who died in 1961 at the age of 90 and who must have fostered his botanical inclinations, made many records of plants for the Bristol area. They frequently visited the Somerset peat moors which held a great attraction for them, and also the Docks at Avonmouth where many aliens were first reported by them. As early as 1914–15, Noel and his mother had together found, as indicated in their annotated copy of White's *Flora*, *Taraxacum palustre* (Barrow Gurney), *Crepis biennis* (Long Ashton), *Mercurialis annua* var. *ambigua* (Failand), and had seen *Vaccinium oxycoccos* growing with *Andromeda polifolia* on the Somerset Levels between Shapwick and Ashcott. But later greater discoveries were to follow: in 1926, as a result of a search extending over several years, they found *Ranunculus ophioglossifolius* in a new locality in W. Glos.; still later they added first records for the district of *Carex laevigata*, *Glyceria declinata*, *Zannichellia gibberosa*, the hybrid grass *Festulolium holmbergii* (new to Britain), *Vulpia ambigua* and also rediscovered *Carex vesicaria* in an Axbridge locality from which it had been reported in 1877.

At Clifton College, Noel did well at his studies and continued his education by reading Classics at Keble College, Oxford. His love of and interest in plants, however, soon secured him a post in the Herbarium at the Royal Botanic Gardens, Kew, where he remained until his death. Here his training in Classics stood him in good stead in relation to the naming of plants, since descriptions in Floras are frequently cited in Latin, particularly in monographic works. At Kew he specialized in the flora of tropical America, and wrote a series of over 70 papers on this subject in the Kew Bulletin, many of them on the family Bignoniaceae. He collected extensively in British Guiana from which he described numerous new taxa, and he made valuable contributions to the Floras of Suriname and of Trinidad and Tobago. He was frequently consulted as a leading expert on S. American plants. Sandwith was also attracted by the flora of the lands of the Mediterranean, notably Spain, and he acquired a substantial knowledge of the plants of these countries in addition to his profound understanding of the British flora. His many articles in Hooker's *Icones Plantarum* and in Curtis's *Botanical Magazine* are well known, and it is not surprising that he held a high international reputation as a taxonomist. The genus *Sandwithia* of the Euphorbiaceae commemorates his name, as well as the specific epithets of several plants.

One had only to work with him in the field for a very short time before his fine personal knowledge and wide reading became obvious, although he was the most modest of men. To visitors at Kew he was known for his helpful attitude and unassuming manner; by some it was regretted that he had a reluctance to undertake public lectures which he claimed were not his metier.

For many years Sandwith acted as a referee for naming plants in the Bristol district, and was an authority on the genus *Fumaria*. A great many hours of his bachelor life must have been spent in the pursuit and study of interesting and critical taxa. He was joint author, with his mother, of *The Adventive Flora of the Port of Bristol* (*Rep. Bot. Soc. Exch. Club*, 1932) and of *Bristol Botany* in these PROCEEDINGS for 1947–60; he continued these reports as sole author for 1961–64. The Card Index which he meticulously kept of plants of the Bristol district was, I believe, to have formed the basis of a new Flora of the area to which he would have devoted his energies on retirement. He maintained his contact with Bristol by periodic visits from Kew to his flat at Clifton, using this as a base for trips to localities rich botanically. Latterly he was much concerned about threats to the natural history of the Somerset peat moors by the extensive exploitation of the peat and the lowering of the water table; he would have been gratified that efforts due partly to his initiative seem now likely to lead to conservation measures.

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His herbarium was kept jointly with that of his mother. Their British native plants were bequeathed to the Rijksherbarium at Leiden in Holland but the valuable collection of adventive plants, containing many rare aliens, has been added to the herbarium of the Department of Botany, University of Bristol, as well as some bryophyte material.

Noel Sandwith was an associate of this Society from 1919 to 1926, and became a corresponding member in 1961. He was a member of many botanical societies and a Fellow of the Linnean Society of London.

As one of the few who could recall the period when White was the leader of field botanists in Bristol, he was an important link with the past which has now been broken. Thanks to his industry in committing to paper his observations, however, much remains to us. He will be missed not only as a distinguished botanist and scholar but also as one of the great lovers of nature and the kindest of men. We extend our sincere sympathy to his brother, Commander E. P. G. Sandwith. A.J.W.

BRISTOL BOTANY IN 1965

By A. J. Willis

BRISTOL Botany was heavily clouded in 1965 by the death of Mr. N. Y. Sandwith in May. An appreciation of this internationally recognized authority on plant taxonomy is given elsewhere in this issue, but here mention must be made of the great enthusiasm and energy shown by him and his mother in studying the plants of the Bristol district over a very long period. Between them they compiled the articles on "Bristol Botany" for 1935 to 1964, authorship being at first by Mrs. Sandwith, then jointly, and finally by N. Y. Sandwith alone. They continued, on the highest standards, the excellent work of J. W. White, elucidating the distribution of critical taxa in the Bristol district as well as adding a number of species and hybrids to the lists. Their particular interest in and great knowledge of alien plants was well known. A valuable legacy, now in my possession, is the Card Index of the local flora, meticulously kept up-to-date by N. Y. Sandwith. It is planned to continue to add records of new localities to this most useful source of information.

For most of the year temperatures in 1965 were below average, February and November being especially cold months, and the summer generally cool and lacking in sunshine except for a fortnight in August. The last week in March was, however, very warm and sunny, with maxima reaching 71°F. at Long Ashton; this warm spell resulted in rapid growth of vegetation after the snow showers of late February and early March and the exceptionally dry conditions during February. Nevertheless, in spite of a very dry October as well, rainfall for the year was above average, wet conditions prevailing in May, June and July and extremely heavy rain falling in December. The stormy very wet weather of December (over 8 inches of rain recorded at Long Ashton) resulted in widespread flooding and the Chew Valley Lake was completely full for the first time in nearly five years.

The considerable number of records of new localities this year is indicative of the continuing keen field-work, especially on the part of certain individuals. Surveys now being undertaken in relation to conservation will undoubtedly add further to our knowledge of plant distribution. It is reassuring, at a time when habitats are so rapidly being altered by man's activities, to note the persistence of species in sites from which they have not been recorded for many years, e.g. *Astragalus glycyphyllos* at Sea Mills, *Vicia lathyroides* at

Brean Down and *Equisetum variegatum* at Berrow. Of even greater interest is the discovery of a substantial colony of *Crinitaria linosyris*, a plant of very few stations in Britain, in a new N. Somerset locality.

An enhanced interest in the study of Bryophytes of the district is given by the work of Mrs. J. Appleyard. She is compiling a Bryophyte Flora of N. Somerset, and many new vice-county records made by her are given at the end of this report.

Names of contributors of several records are abbreviated thus:—

J. A., Mrs. J. Appleyard
J.F.B., J. F. Burton
I.W.E., I. W. Evans
G.W.G., G. W. Garlick
I.F.G., Miss I. F. Gravestock
R.M.H., Dr. R. M. Harley
J.F.H.S., Dr. J. F. Hope-Simpson
M. H. M., Dr. M. H. Martin
P.J.M.N., P.J.M. Nethercott
R.G.B.R., Capt. R. G. B. Roe, R.N.
D.M.S., Dr. D. Munro Smith
E.S.S., E. S. Smith
A. J. W., Dr. A. J. Willis

Papaver dubium L. On ground disturbed in building operations, Mizzymead, Nailsea, **S.**, *E.S.S.*

Lepidium heterophyllum Benth. Among wire netting in open area, Portway, Bristol, **G.**, *A. Wilfrid Adams*, det. *A.J.W.*

Rorippa amphibia (L.) Bess × *sylvestris* (L.) Bess. Water-side, Catcott, **S.**, 1920, *H. T. Devis* in *Herb Kew*, det. *Bengt Jonsell*, 1965.

Geranium pusillum L. By R. Frome, Moorend, **G.**, *D.M.S.*

G. robertianum L. A form of Herb Robert with pure white flowers, Harptree Combe, **S.**, *P.J.M.N.*

Erodium maritimum (L.) L'Hérit. By the side of one of the artificial ledges, Velvet Bottom, Mendip, **S.**, *J.F.H.S.* and *M.H.M.*, a somewhat inland habitat for the Sea Storksbill.

Astragalus glycyphyllos L. Sea Mills, **G.**, *P.J.M.N.* This Milk-vetch was reported by G. H. K. Thwaites from Sea Mills as noted in Swete's *Flora Bristoliensis* (1854), but there is no subsequent record from that neighbourhood until this most interesting rediscovery in the same locality.

Vicia sylvatica L. Wood Lane, Clapton-in-Gordano, **S.**, *E.S.S.*

V. lathyroides L. In turf, with *Saxifraga tridactylites* L., Brean Down, **S.**, *T. J. Wallace*, conf. *A.J.W.* Although plentiful on the Berrow sand-hills, the Spring Vetch has not been recorded from Brean Down in recent years.

Rosa rubiginosa L. A large bush established on waste ground by the R. Frome, Moorend, **G.**, *D.M.S.*

Hippuris vulgaris L. Pond at Charterhouse, **S.**, *P.J.M.N.* A first record of Mare's-tail from Mendip.

Oenanthe pimpinelloides L. Kelston, below Prospect Stile, **S.**, *R.G.B.R.*

Arbutus unedo L. Goblin Combe, Cleeve, **S.**, *P.J.M.N.* The Strawberry Tree, an evergreen which is often planted, is now regenerating in Goblin Combe.

Primula veris L. × *vulgaris* Huds. Millbrook, Windsor Hill, Shepton Mallet, **S.**, *I.F.G.*

Echium vulgare L. A few plants, Tickenham Hill, **S.**, *E.S.S.*

Chaenorhinum minus (L.) Lange. Growing with *Bromus madritensis* L. in the Gully, Avon Gorge, **G.**, *A.J.W.*

Lathraea squamaria L. On Elm, a frequent host of Toothwort, above Markham Brook, near Pill, **S.**, *J.F.B.*

Utricularia vulgaris L. This Bladderwort was prolific on Kenn Moor, **S.**, many hundreds of plants flowering over a stretch of at least 100 yards of rhine, *Mr.* and *Mrs. C. H. Cummins.*

Thymus pulegioides L. Sea Mills, **G.**, *P.J.M.N.*

Galeopsis bifida Boenn. Downend, **G.**, *D.M.S.*

Cruciata chersonensis (Willd.) Ehrend. In abundance along towpath between Hanham and Conham, **G.**, *D.M.S.*

Galium uliginosum L. Marshy field near Dyrham, **G.**, *R.G.B.R.*

Sambucus ebulus L. Waste ground, Kingswood, Bristol, **G.**, *D.M.S.*

Bidens tripartita L. On old tip in disused quarry, Kingswood, Bristol, **G.**, *D.M.S.*, det. *A.J.W.;* a rather unusual site, away from water, for this Bur-Marigold.

Senecio sylvaticus L. Roadside at Tog Hill, **G.**, and disused coal-tip at Radstock, **S.**, *R.G.B.R.*

S. vulgaris L. var. *radiatus* Koch. Garden weed, Pill, **S.**, *J.F.B.*

Gnaphalium sylvaticum L. A small patch, Engine Lane, Nailsea, **S.**, *E.S.S.*

Crinitaria linosyris (L.) Less. [*Aster linosyris* (L.) Bernh.]. An excellent discovery of this very rare plant (Goldilocks) in a second locality in North Somerset, *P.J.M.N.* It is confined to a small area, but present in substantial quantity, some 500 flowering stems being observed.

Eupatorium cannabinum L. A white-flowered form of Hemp Agrimony by the Tennis Courts, Portway, Bristol, **G.**, *Mrs. G. S. Wakefield.*

Hieracium maculatum Sm. In profusion, disused quarry, Windsor Hill, Shepton Mallet, **S.**, *I.F.G.*

Polygonatum multiflorum (L.) All. Cheddar Cliffs, **S.**, *P.J.M.N.* The 'Angular Solomon's Seal', *P. odoratum* (Mill.) Druce, has long been known from the cliffs.

Ornithogalum umbellatum L. In turf, White Hill, Hambrook, **G.**, *I.W.E.*

Juncus compressus Jacq. Roadside ditch, near North Stoke, **S.**, *R.G.B.R.*

J. subnodulosus Schrank. Marshy valley near Foxcote, **S.**, with *Molinia caerulea* (L.) Moench, *R.G.B.R.*

Orchis morio L. At least a dozen plants with whitish flowers, Worle Hill, **S.**, *Dr. J. H. Davie.*

Typha latifolia L. Pond, Moorend, by R. Frome and Beck's Pool, Frenchay, **G.**, *D.M.S.*

Eriophorum angustifolium Honck. Pool in disused quarry, Shortwood, **G.**, *D.M.S.*; with the Cotton Grass is also *Equisetum fluviatile* L.

Scirpus holoschoenus L. The single small colony at Berrow, **S.**, was completely mown off during golf course operations in the spring, 1965, but made regrowth and several inflorescences were present in August, *A.J.W.*

Carex echinata Murr. Millbrook, Windsor Hill, Shepton Mallet, **S.**, *I.F.G.*

Sieglingia decumbens (L.) Bernh. Bannerdown, near Bath, **S.**, *Dr. J. L. Dobbie.*

Poa angustifolia L. On the Somerset-Wiltshire border, near Limpley Stoke, *Miss V. A. Clark* and *Miss J. Spira,* det. *R.M.H.* and *A.J.W.*, conf. *Dr. E. F. Warburg.* Not uncommon on the oolite of the Cotswolds, but few records for N. Somerset.

P. subcaerulea Sm. (sensu lato). On sandy soil, Lyncombe Hill, Churchill, **S.**, and Bury Hill, Winterbourne, **G.**, both leg. and det. *G.W.G.*, 1957, conf. *Dr. C. E. Hubbard.*

Calamagrostis epigejos (L.) Roth. Crook Peak, **S.**, *P.J.M.N.*

Blechnum spicant (L.) Roth. Brookside between Camerton and Radstock, **S.**, *R.G.B.R.*

Polystichum setiferum (Forsk.) Woynar. Several plants, Moggs Wood, Tickenham, and Brockley Combe, **S.**, *E.S.S.*

Polystichum aculeatum (L.) Roth. Wood Lane, Clapton-in-Gordano, **S.**, *E.S.S.*

Thelypteris phegopteris (L.) Slosson. The Beech Fern is still present in Leigh Woods, **S.**, *P.J.M.N.*, where the plateau supports a good range of ferns.

Equisetum variegatum Schleich ex Weber & Mohr. Low ground, stripped of vegetation several years previously, on inland part of dune system (see also *Bot. Exch. Club Rep.* 1932, p. 276), with a tiny single-flowered form of *Centaurium pulchellum* (Sw.) Druce, Berrow, **S.**, *A.J.W.*

ALIENS. *Coronopus didymus* (L.) Sm. On sand excavated from ditch in dune slack, Berrow, **S.**, *A.J.W.*

Sisymbrium altissimum L. Disused railway near Camerton, **S.**, B.N.S. meeting, comm. *R.G.B.R.*

Amaranthus hybridus L. × *retroflexus* L. The valid name for this hybrid is *A.* × *adulterinus* Thell. and only two British gatherings have been made, not four as given in 'Bristol Botany' in 1964 (see J. P. M. Brenan: *Proc. Bot. Soc. Brit. Is.* **6**, 122-3, 1965).

Chenopodium hybridum L. In small quantity, with more plentiful *C. polyspermum* L. and *C. ficifolium* Sm., disused quarry, Kingswood, Bristol, **G.**, *D.M.S.*, det. *J. P. M. Brenan.*

Impatiens parviflora DC. In abundance by road, Brockley Combe, **S.**, *E.S.S.*, conf. *A.J.W.*

Cotoneaster microphyllus Wall. ex Lindl. One bush, Westpark Wood, Clapton-in-Gordano, **S.**, *E.S.S.*

Sedum dasyphyllum L. One patch still at White's Hill, Hambrook, **G.**, *I.W.E.*

Saxifraga spathularis Brot. × *umbrosa* L. Roadside adjoining disused quarry, Windsor Hill, Shepton Mallet, **S.**, *I.F.G.*

Tellima grandiflora (Pursh) Dougl. ex Lindl. Among brambles above Hotwells, Avon Gorge, **G.**, *Miss E. Chittenden*, det. *A.J.W.*

Datura stramonium L. Waste ground, Kingswood, Bristol, **G.**, *D.M.S.*; also at Wellow, **S.**, *R.G.B.R.*

Verbascum blattaria L. Several plants on ground now being built on, Jacklands, Tickenham, **S.**, *E.S.S.*

Veronica filiformis Sm. Several large patches in turf of Durdham Down and by Sea Walls, Bristol, **G.**, *P.J.M.N.* and *I.W.E.*

Lamium maculatum L. A white-flowered form in roadside verge, Nailsea, **S.**, *E.S.S.*, det. *A.J.W.*

Ambrosia artemisiifolia L. Specimen in bud, early Nov., Old Market, Bristol, **G.**, *I.W.E.*, det. *A.J.W.*

Elodea ernstae St. John. Rain-pools, waste ground, Frenchay, **G.**, *D.M.S.*

Crocosmia × crocosmiflora (Lemoine) N.E. Br. About six plants well away from houses, Kenn Moor, **S.**, *Mr.* and *Mrs. C. H. Cummins.*

Lolium temulentum L. Waste ground at Holloway, Bath, **S.**, *R.G.B.R.*

Briza maxima L. A few plants on roadside verge adjoining Leigh Woods, **S.**, *Miss P. C. Jones,* conf. *R.M.H.* and *A.J.W.*

Hordeum jubatum L. By road excavations between Downend and Codrington, **G.**, *Mrs. N. Elliott,* det. *A.J.W.*

Avena sativa L. × *A. fatua* L. Disturbed ground near The Viaduct, Coalpit Heath, **G.**, *G.W.G.*, 1957, det. *Dr. C. E. Hubbard.*

BRYOPHYTES. Sphagnum subsecundum Nees var. *auriculatum* (Schimp.) Lindb. With *S. fimbriatum* Wils. and *S. plumulosum* Röll. in pools near Priddy, Mendip, **S.**, *D.M.S.*, all det. *Miss U. K. Duncan.*

Polytrichum aurantiacum Sw. In 1962, Downend, **G.**, *D.M.S.*, det. *F. A. Sowter.* New to v.c. 34, W. Glos.

Fissidens bambergeri Schimp. ex Milde. Muddy ground at margin of pond at Kendleshire, near Coalpit Heath, **G.**, *D.M.S.*, det. *A. H. Norkett.*

Ceratodon chloropus (Brid.) Brid. This very rare moss was until recently known in Britain only at Walton-in-Gordano, **S.** Now recorded from Devon, it has also been found by *J.A.* in a second Somerset locality in 1961 at Swallow Cliff (Sand Point). In the same area she discovered *Bryum capillare* Hedw. var. *torquescens* (Bruch ex De Not.) Husn., formerly recorded for N. Somerset only from Wookey Hole.

Dichodontium pellucidum (Hedw.) Schimp. Brook, Rodway Hill, **G.**, *D.M.S.*, det. *R. D. Fitzgerald.*

Tortula marginata (B. & S.) Spruce. Noted by Stoddart and Hopkins in 1861, but no subsequent record until 1965 when observed in King's Wood near Winscombe, **S.**, *J.A.*

T. cuneifolia (With.) Turn. On cliff walk, Redcliff Bay, north of Clevedon, **S.**, *J.A.*, who also found *Phascum curvicollum* Hedw. in this vicinity.

Eucladium verticillatum (With.) B., S. & G. This was reported last year from Glen Frome, Stapleton, **G.**, on sandstone rocks, an unexpected habitat for this calcicolous moss. Particles adhering to the specimen (leg. *D.M.S.*, det. *F. A. Sowter*, conf. *J.A.*) have now been examined by Dr. J. W. Cowie who reports that the material is essentially calcareous, with some comminuted shell and only occasional well-rounded quartz sand-grains. The rocks may be locally calcareous, or the material associated with the moss on the wet rocks tufaceous.

Rhacomitrium fasciculare (Hedw.) Brid. In old quarry S.W. of Coleford, **S.**, together with *R. heterostichum* (Hedw.) Brid., *J.A.*

Bryum intermedium (Brid.) Bland. Old wall, Westerleigh, **G.**, *D.M.S.*, det. *Dr. E. V. Watson.*

Mnium rugicum Laur. Priddy Pools, **S.**, *J.A.*

M. pseudopunctatum B. & S. Rowberrow, **S.**, *Herb C.I.* and *N. Y. Sandwith*, conf. *J.A.*

Amblystegium serpens (Hedw.) B., S. & G. var. *salinum* Carr. Redcliff Bay, north of Clevedon, **S.**, *J.A.* New to v.c.6, N. Somerset.

Drepanocladus uncinatus (Hedw.) Warnst. Tor Hole, near Priddy, **S.**, *J.A.*; a second record for v.c.6.

Acrocladium stramineum (Brid.) Rich. & Wall. Priddy Pools, **S.**, *D.M.S.*, and near Decoy Farm, Westhay Moor, **S.**, *J.A.*

Marchantia polymorpha L. var. *aquatica* Nees. Emborough Pool, **S.**, *J.A.*, 1959; a second record for v.c.6.

Pallavicinia lyellii (Hook.) Gray ex Trev. A flourishing patch on peat track, Walton Heath, **S.**, *J.A.*, a third locality on the peat moors.

Blasia pusilla L. Clayey bank in wood S.W. of Coleford, **S.**, *J.A.*, a second record for N. Somerset.

Plectocolea hyalina (Lyell ex Hook.) Mitt. West Horrington, **S.**, *J.A.;* a second record for v.c.6.

Marsupella emarginata (Ehrh.) Dum. On igneous rocks, Downhead, near Shepton Mallet, **S.**, *J.A.;* the only record for v.c.6 this century.

Cephalozia bicuspidata (L.) Dum. var. *lammersiana* (Hüb.) Breidl. In *Molinia* swamp, at foot of Blackdown, Mendip, **S.**, with *Calypogeia fissa* (L.) Raddi and *Aulacomnium palustre* (Hedw.) Schwaegr., *G.W.G.*, 1957, conf. *Mrs. J. A. Paton*, comm. *J.A.* New to v.c.6.

C. media Lindb. Mells Park, **S.**, *J.A.;* the only other record for v.c.6 is from Street Heath.

The following new records made for v.c.6 by Mrs. J. Appleyard have been reported in the last few years in the Transactions of the British Bryological Society:—from Bathford Hill: *Seligeria acutifolia* var. *longiseta;* from Warleigh: *Campylium calcareum, Tortella inflexa;* from Walton-in-Gordano: *Eurhynchium schleicheri;* from Wrington: *Weissia rutilans;* from Goblin Combe: *Orthotrichum stramineum;* from Charterhouse: *Weissia controversa* var. *densifolia;* from Priddy Pools: *Plagiothecium ruthei;* from Emborough: *Fossombronia wondraczekii, Pellia neesiana;* from Coleford: *Cratoneuron commutatum* var. *falcatum;* from Mells Park: *Amblystegium kochii, Eurhynchium speciosum;* from Downhead: *Dicranella palustris, Fissidens curnowii, Scapania compacta;* from Shapwick: *Drepanocladus fluitans* var. *fluitans.*

* * * * *

SPHAGNUM SPECIES ON SHAPWICK HEATH: A CORRECTION

The account of vegetation on Shapwick Heath by Hope-Simpson, Newton and Ricketts (*Proc. Bristol Nat. Soc.* **30**, 1963) refers on pp. 350 and 357 to the occurrence of *Sphagnum rubellum.* Mrs. J. Appleyard has drawn attention to the fact that this species had not hitherto been recorded there (or elsewhere in v.c.6). Specimens from three separate clumps were therefore submitted to Miss E. M. Lobley. She kindly examined them and reports that two are *S. capillaceum* (Weiss) Schrank and one is *S. plumulosum* Röll. Both species were collected in the "heathy bog" community.

J. F. Hope-Simpson.

BRISTOL BIRD REPORT
1965

COMPILED BY THE EDITORIAL COMMITTEE OF THE
B.N.S. ORNITHOLOGICAL SECTION

P. J. CHADWICK H. R. HAMMACOTT
H. H. DAVIS R. J. PRYTHERCH
G. SWEET

AN Arctic Warbler from Sand Point in August was a first record for Somerset. Other rarities included, from Chew Valley reservoir, two Black-winged Stilts and a Blue-headed Wagtail in May, a Pied-billed Grebe (the third British record) and an Aquatic Warbler in August, and an influx of Bearded Tits in Autumn. From Blagdon, there are reports of a Red-necked Phalarope in September, and from the New Grounds a Spoonbill in July.

Bewick's Swans occurred in the district in much larger numbers than usual and the Collared Doves continued their spread.

The Birds of Prey study is already giving a fuller picture of the local situation than has previously been possible; a detailed analysis is now in progress; meanwhile the enquiry continues. The request for all sight-records provided useful information on Stock Dove, Kingfisher, Cuckoo and woodpeckers. We plan to extend this approach to the study of other species where distribution or status is not clearly known.

The continued growth in the number of record cards is most gratifying. It would greatly help however if contributors gave details of what was really seen and recorded on the spot without recourse to text-books. Without exception, the immediate record bears the stamp of authenticity lacking in superficially more complete worked-up versions. Since sight-records and trapping have generally displaced other methods of identification, nothing less than the most exacting standards of observing and recording can be a satisfactory substitute.

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Headings **G.** and **S.** refer to South Gloucestershire and North Somerset and cover the areas as defined in *Proc. B.N.S.*, 1960, p.114.

GREAT NORTHERN DIVER *Gavia immer*

S. One, Blagdon res., Dec. 4–19 (R.M.C., M.P. *et al.*).

GREAT CRESTED GREBE *Podiceps cristatus*

G. Pair bred, Tortworth Court Lake (J.H.).

S. Despite high population at reservoirs—157, Chew Valley, Mar. 7 (P.J.C.) and 183, July 17 (B.K.)—low water levels precluded successful breeding. The only broods noted were two at Orchardleigh Lake (R.M.C.).

RED-NECKED GREBE *Podiceps griseigena*

S. One, Chew Valley res., Aug. 4, seen by P.L.G., who has supplied conclusive details.

SLAVONIAN GREBE *Podiceps auritus*

S. Single bird, Cheddar res., Dec. 27 (J.A.McG., M.G.W.).

BLACK-NECKED GREBE *Podiceps nigricollis*

S. One, Chew Valley res., Sept. 4, 5 (A.A.C. *et al.*); three, same place, Oct. 5 (R.D.O.), two on 23rd (R.A.), and another, Dec. 23 (W.L.R.). One, Blagdon res., Sept. 11–18 (P.J.C., R.J.S.).

Pied-billed Grebe *Podilymbus podiceps*

S. Adult assuming winter plumage, Chew Valley res., Aug. 17–Oct. 23 (G.L.B., V.E.G. *et al.*). Record, second for Bristol District and third for Britain, accepted by *Brit. Birds* Rarities Committee (cf. *Brit. Birds* 1965, pp. 305 and 391).

Fulmar *Fulmarus glacialis*

S. Freshly dead adult, Sand Bay, Feb. 28 (R.A.). One in flight off Steep Holm, Aug. 22 (Res. Stn.).

Gannet *Sula bassana*

S. Adult circling Steep Holm after gale, Aug. 21 (Res. Stn.) and imm., Weston Bay, Dec. 31 (P.C.).

Little Egret *Egretta garzetta*

S. Adult in breeding plumage, Axe Estuary, May 22, viewed from 35 yd. by T.R.J.W., who has supplied conclusive details. Record, second for Bristol District (cf. *Proc. B.N.S.*, 1955, p. 113), accepted by *Brit. Birds* Rarities Committee.

Bittern *Botaurus stellaris*

G. One, W.T. enclosures, New Grounds, Oct. 20 (L.P.A.).

S. One in flight, Chew Valley res., Sept. 27 (B.K.). Another, same reservoir, Nov. 14–Dec. 31 (P.R., D.S. *et al.*).

Spoonbill *Platalea leucorodia*

G. Adult on riverbank, New Grounds, July 18–20 (L.P.A.).

Mallard *Anas platyrhynchos*

G. and **S.** Data less comprehensive than for 1964 but total in area about 2,950, mid-Jan., and 3,100, mid-Feb. and mid-Dec.

Teal *Anas crecca*

G. Max. counts, New Grounds:—360, Jan. 19, and 450, Dec. 13 (L.P.A., M.A.O.).

S. Winter total remained high, Jan.–Feb., with peak of 1,700, Feb. 14, falling to 750, Mar. 14. Autumn counts incomplete but probably not more than 1,300 in area.

GARGANEY *Anas querquedula*

S. Pair, Chew Valley res., Apr. 7 (R.J.P.) and six on 11th (D.S.). Pair, Blagdon res., Apr. 15, May 1 (K.E.V. *et al.*). One or two pairs, Chew Valley res., May 8–June 4 (R.J.S., W.J.S. *et al.*); pair, July 31 (R.J.P.)—but no reports of breeding; one or two, Aug. 10 (K.E.V.) and 17th (R.J.S.); late females, Oct. 24, Nov. 6 (B.K.).

GADWALL *Anas strepera*

G. Max. count, New Grounds—38, Jan. 19 (M.A.O.).

S. Small numbers early in year, mostly at Chew Valley res. where at least seven pairs subsequently bred (B.K., R.J.P., B.E.S. *et al.*).

WIGEON *Anas penelope*

G. and **S.** Some 2,700 in area, Jan. 17 (K.L.F., M.A.O. *et al.*), Mar. 7 (P.J.C.). Autumn records from Sept. 12, numbers rising in early December to 2,000 on 11th and *c.* 2,200 on 28th (B.K., R.J.S. *et al.*).

PINTAIL *Anas acuta*

G. and **S.** Approx. 300 in area, mid-Jan. (230, New Grounds). One, Blagdon res., July 4 (M.K., T.B.S.). Slow autumn build-up, Aug. 28 onwards, to peak total of 275, mid-Dec. (120, Chew Valley res.; 150, New Grounds).

SHOVELER *Spatula clypeata*

G. Max. count, New Grounds—64, Jan. 19 (M.A.O.).

S. No large numbers seen. Max. of 40, all waters, Jan. 17, and 90, Sept. 18, Dec. 28 (P.J.C., B.K., B.R. *et al.*). Five broods, Chew Valley res., June–July (G.L.B., R.J.P.).

RED-CRESTED POCHARD *Netta rufina*

S. Pair, Cheddar res., Nov. 7–13 (R.M.C., H.H., B.R. *et al.*) and female on 27th (R.M.C., B.K.).

SCAUP *Aythya marila*

S. Single males, Cheddar, Blagdon and Chew Valley resrs., all months (A.H.D., J.A.McG., E.A.M.) and two, Chew Valley res., Dec. 19 (P.J.C.). Several females reported but descriptions inconclusive except for single birds, Cheddar res., Oct. 11, 29 (B.R.), Dec. 18 (B.E.S.) and two, Nov. 8 (B.R.).

TUFTED DUCK *Aythya fuligula*

S. Winter counts not exceeding 200, all waters (R.J.P., W.L.R.), but *c.*200, Blagdon res., Apr. 24 (P.J.C.) and 215, May 1 (K.L.F.) —nearly all males. Two pairs bred, Barrow Gurney resrs. (T.B.S.). Breeding also reported, Chew Valley res., but total not assessable. Autumn counts, all waters—210, Sept. 18; 475, Oct. 17 (possibly some double counting due to flighting between resrs.); and 220, Dec. 11 (J.F.R., B.E.S. *et al.*).

POCHARD *Aythya ferina*

G. Sixty in W.T. enclosures, New Grounds, Mar. 14 (L.P.A.).

S. Total fell from 430 end 1964 to 275, Jan. 17 and further reduced, Feb. and March (B.K., E.A.M. *et al.*). Four nests found, Chew Valley res., but three robbed (A.E.B.); two or three broods seen later (G.L.B., R.J.P.). Autumn arrivals, mid-Sept. onwards: initially, majority at Blagdon res.—500+, Oct. 2–10 (R.D.O. *et al.*) and 700 on 17th (R.J.P.) but then moved to Cheddar where peak count of 1,110, Nov. 14 (J.A.McG.).

GOLDENEYE *Bucephala clangula*

S. No large evening gatherings reported. Max. counts (approx.), all waters—17, Jan. 17; 30, Feb. 27; 32, Mar. 14; 23, Nov. 21; and 25, Dec. 24 (M.K., D.E.L., M.A.W. *et al.*).

COMMON SCOTER *Melanitta nigra*

G. Male on Estuary, New Grounds, May 3 and female, July 25 (L.P.A.).

S. Up to eight (5♂♂), Weston Bay, Feb.–May 8 (E.G.H., T.R.J.W. *et al.*) and one, Chew Valley res., Apr. 18 (K.B.Y.). Autumn records: male, Weston Bay, Sept. 4 (B.E.S.) and four, Dec. 5 (P.C.); male, Cheddar res., Nov. 8 (B.R.) and two ♀♀ off Clevedon, Nov. 20 (B.K.).

GOOSANDER *Mergus merganser*

G. Three on Estuary, New Grounds, Nov. 28–Dec. 19 (L.P.A.).

S. Most records from Chew Valley res., where up to four seen, Jan.–Feb., and two still present, Mar. 7 (P.J.C., B.K. *et al.*). Max., Cheddar res., of five, Jan. 9 (M.G.W.) and three on 17th (J.A.McG.). Autumn records—Oct. 31 to end year—include: up to five, Chew Valley, Dec. 5–18 (A.H.D., K.E.V.); two, Blagdon, Nov. 13 (G.C.B., S.I.B.) and one, Dec. 24 (B.E.S.); two, Cheddar, Dec. 28 and 30th (R.N.L., M.P., P.R.). One, Weston Bay, Nov. 14 (R.A.).

SMEW *Mergus albellus*

S. Pair, Blagdon res., Jan. 2–Mar. 14 (R.D.O. *et al.*) and five (1♂), Feb. 4 (H.A.T.); one ♂, Apr. 8 (W.L.R.). Two pairs, Chew Valley res., Jan. 2–Mar. 7 (M.E.B., K.L.F.) and five (3♂♂), Feb. 7 (K.E.V.). Autumn records only from Chew Valley res.—up to three, Dec. 5–31 (P.L.G., B.R.).

NORTH AMERICAN RUDDY DUCK *Oxyura jamaicensis*

S. Up to eighteen at resrs., Jan.–Mar. (R.A., D.S. *et al.*) but dispersed and only one pair reported, Chew Valley, June–July (B.K., R.J.P.). Gradual increase, Chew Valley, Sept. onwards with max. of thirteen (7♂♂), Nov. 27 and thirteen (5♂♂), Dec. 28 (J.E.A., W.J.S., D.W.). Two late broods, same res.—♀ with one duckling under a week old, Oct. 31 (P.J.C., M.A.W.) and two ducklings, ½ to ¾ grown, Nov. 6 (B.K.).

SHELDUCK *Tadorna tadorna*

G. and **S.** Aerial coastal surveys put total of ads. in area at *c.*245, mid-June (H.J.B., M.A.O.). Ground counts, Weston-s-Mare to mouth of R. Avon—220 ads., 57 ducklings, June 13 but prolonged nesting season with other broods seen later (per S.M.T.), cf. *Proc. B.N.S.* 1964, p. 39.

WHITE-FRONTED GOOSE *Anser albifrons albifrons*

G. Numbers, New Grounds, reached peak of 3,500, Jan. 25, falling to 1,950, Mar. 10, 12; all had left by 18th. First autumn arrivals—three, Sept. 28, increasing steadily to 800, Dec. 18; 1,600 on 20th and max. of 1,800 on 31st (W.T.).

S. Fourteen flying N., Sand Point, Jan. 9 (D.J.P.) and five, Pill, on 10th (K.B.Y.). Four, Chew Valley res., Nov. 20; three on 28th (D.E.L., B.R.) and one, Dec. 15 (B.R.).

BEAN GOOSE *Anser fabalis*

G. Adult ♂ with ♀ Whitefront and hybrid offspring, New Grounds, first reported Oct. 1964, remained until Mar. 10 (M.A.O.).

PINK-FOOTED GOOSE *Anser brachyrhynchus*

G. New Grounds: one, Mar. 10 (M.A.O.); nineteen, Sept. 26, Nov. 2; two, Dec. 12, and one on 20th (L.P.A. *et al.*).

BRENT GOOSE *Branta bernicla*

G. Juv., New Grounds, Nov. 24; ad. and juv., same place, Nov. 30 (M.A.O.), Dec. 4 (M.L.D., P.R.)—all dark-breasted form.

S. Party of 31, Axe Estuary, Dec. 23 (P.C.).

BARNACLE GOOSE *Branta leucopsis*

G. Juv. first reported, New Grounds, Dec. 31, 1964, remained until Mar. 10 (W.T.).

CANADA GOOSE *Branta canadensis*

S. One, Cheddar res., Jan. 7–17 (W.L.R. *et al.*) and one, probably same bird, Stoke Moor on 16th (T.B.S.). Party of sixteen, Claverham Moor, nr. Yatton, Oct. 26 (M.K.).

WHOOPER SWAN *Cygnus cygnus*

S. Party of four with Bewick's Swans, Blagdon res., Feb. 7 (A.H.D., R.J.S., K.E.V.) and two ads., Chew Valley res., Nov. 20 (R.A.).

BEWICK'S SWAN *Cygnus columbianus*

G. New Grounds: rarely below 40, Jan.–early March, with peaks of 74, Jan. 10; 65, Feb. 5 and 60, Mar. 8—many fed daily in Rushy Pen. First autumn bird, Oct. 19, twenty on 31st increasing to 86, Nov. 29–Dec. 7; some dispersal to flood water reduced total to 54, Dec. 13 (M.A.O., P.S. *et al.*).

S. Chew Valley res.: 56, Jan. 4—highest count on record (H.W.N.); 30–44, Jan.–early March. Blagdon res.: 21–29, Jan.–Feb. Details suggest area total *c.* 60. First autumn record: eight, Chew Valley res., Oct. 18 (B.C.P., E.M.P.). Max. in area, 37, Nov. 13 (G.C.B., S.I.B., D.S. *et al.*).

BUZZARD *Buteo buteo*

G. Single birds, New Grounds, Mar. 10, Nov. 6 (L.P.A.) and Wotton-under-Edge, July 22 (J.E.A.).

S. Sight-records (145) for all months include Bleadon Hill, Banwell, Mendip area, reservoirs, Wells and Bath, Mar.–August. Six together, Mar. 28 (R.J.P.). Three breeding records. Distribution of sightings suggests breeding season population of ten to twelve pairs in southern half of district.

SPARROWHAWK *Accipiter nisus*

G. and **S.** Sight-records (132), all months, mostly from **S.** Four nests (three in **G.**) contained total of sixteen eggs from which seven young reared. All **G.** records in period Mar.–July.

GOSHAWK *Accipiter gentilis*

S. Single birds, Chew Valley res., Sept. 27 (B.K.) and Oct. 2 (R.M.C., B.K.). Both observers mention large size, broad rounded wings and long tail.

HARRIER *Circus spp.*

S. Single 'ringtails,' Chew Valley res., Aug. 22 (A.H.D., R.J.S., K.E.V.); Blagdon res., Sept. 26 (H.A.T.) and Brean Down, Oct. 26 (T.R.J.W.).

OSPREY *Pandion haliaetus*

S. One, Chew Valley res., Aug. 16 (C.F., H.W.N.); one, probably two, same place, Sept. 7 (A.C.L.); one, imm., Blagdon res., Sept. 11 (M.K.) and this or another imm., Chew Valley res., same date but later in day (T.B.S., R.H.T.) was subsequently seen on nine days, Sept.–early Oct. (eighteen observers); last reported, Oct. 4 (D.W., M.A.W.).

HOBBY *Falco subbuteo*

G. One, Marshfield, July 14 (R.M.C.) and one, nr. Dyrham Park, Sept. 14 (P.L.G.).

S. Pair reared two young, last seen Sept. 12—*Eds.* One, sometimes two, Chew Valley res., twenty dates, May 1–Oct. 10 (ten observers); single birds, Bath, May 11, 16 (R.J.L.); St. Catherine's, May 23 (A.A.C.); Weston, May 23, Oct. 2 (R.A.); Mendip area, June 20, Aug. 1, 2 (R.M.C., M.K., R.J.P.); Whitchurch, Aug. 28 (R.J.S.); Wick St. Lawrence, Sept. 5 (T.B.S.); Prior Park, Bath, Sept. 9 (R.M.C.); Blagdon, Sept. 18 (P.J.C.) and Compton Martin, Sept. 27 (B.K.).

PEREGRINE *Falco peregrinus*

G. Ad. ♂, New Grounds, first seen Sept. 19, 1964, until Apr. 13 (L.P.A., M.A.O.); another, same place, Oct. 13–end of year (M.A.O.).

S. Single birds, Clapton-in-Gordano, Apr. 29 (H.H.D.); Brean Down, Oct. 17 (T.R.J.W.) and Nov. 14 (P.J.C., M.A.W.).

MERLIN *Falco columbarius*

S. Single birds, Clevedon, Mar. 14 (K.L.F., K.E.V.); Brean Down, Nov. 14 (P.J.C., M.A.W.) and Yoxter, Mendip, on 21st (P.J.C., M.A.W.).

KESTREL *Falco tinnunculus*

G. and **S.** Sight-records (420), all months, mostly from **S.** Brood of six young ringed, Walton Moor, June 5; one recovered, Clapton Moor, Aug. 28 and one, Honiton, Devon, Dec. 9 (P.J.C.).

RED-LEGGED PARTRIDGE *Alectoris rufa*

S. One, Charterhouse, Mendip, Jan. 14 (A.H.D., R.J.S.). Up to three, Sand Point, six dates, Mar.–June (D.J.P., W.L.R. *et al.*). Single bird, Brean Down, Apr. 3 (D.S.) and two, same place, June 8 (R.A.); two, Goblin Combe, Apr. 4 (M.K.) and one, Odd Down, nr. Bath, Apr. 8 and Combe Hay, July 10 (R.M.C.).

PARTRIDGE *Perdix perdix*

S. Records, coastal and inland, include: three pairs, Kingston Seymour, Mar. 13 (D.S.); 25, Chew Valley res., Aug. 17 (K.L.F.); sixteen, Woodspring Bay, Aug. 17 (D.J.P.); six, Charmy Down, Bath, Sept. 5 (A.A.C.) and up to five, Yatton Moor, Oct.–Nov. (H.H.D.).

QUAIL *Coturnix coturnix*

G. and **S.** Single birds calling, Weston-in-Gordano, June 5 (P.J.C.); Marshfield, July 14 and Langridge, nr. Bath, July 25 (R.M.C.).

WATER RAIL *Rallus aquaticus*

S. Two, Blagdon res., Jan. 9 (M.K.). Up to four, Sand Bay, five dates, Jan.–Mar., Oct. and Dec. (R.A., D.J.P., W.L.R. *et al.*). Single birds, nr. Ubley, Mar. 7 (P.J.C.); Litton res., Oct. 24 (G.S.) and Locking Pond, Weston, Dec. 2 and 22 (P.C.). Reported from Chew Valley res., Jan.–Mar. and Sept. until end of year.

SPOTTED CRAKE *Porzana porzana*

S. Single birds, Chew Valley res., July 25, Aug. 17, 22nd, Oct. 24, Nov. 14, Dec. 4 (R.A., R.M.C., D.W. *et al.*).

COOT *Fulica atra*

S. Only two, Cheddar res., Jan. 10, 31 and max. of 380, Nov. 14—low numbers due to lack of available weed since drying out of reservoir in autumn, 1964 (J.A.McG.). Other reservoir records: 426, Blagdon, Jan. 17 (R.J.P.), 821, Dec. 12 (R.J.P.), 715, Dec. 19 (P.J.C.); 1,200, Chew Valley, July 17 and 1,390, Dec. 28 (B.K.).

LAPWING *Vanellus vanellus*

G. Approx. 600, New Passage, Dec. 16 (R.A.).

S. Weather movements noted include 1,560 in one hour after heavy snow, Weston-s-Mare, Mar. 4 (R.A.). Breeding season records: up to six pairs, Clapton Moor, Kenn Moor, Kewstoke, Yeo Estuary, St. George's, nr. Weston-s-Mare, Blagdon res. (two pairs with young) and Chew Valley res. Total of 1,800 on flood water, Kenn Moor, Dec. 5 (M.V.T.).

RINGED PLOVER *Charadrius hiaticula*

S. Only large counts: up to 250, Sand Bay—Weston Bay, Aug.–early Sept. Inland records include up to four, Chew Valley res., Apr. 3–July 4 and single birds, July 28, Aug. 22 and 30th, and Blagdon res., Apr. 9 (P.C., R.M.C., D.S. *et al.*).

LITTLE RINGED PLOVER *Charadrius dubius*

S. Two, Cheddar res., Mar. 31 (E.A.M.). One, imm., Chew Valley res., July 18 (R.M.C.).

GREY PLOVER *Charadrius squatarola*

S. Inland records—one, Chew Valley res., Feb. 28 (D.E.L.), and two, Blagdon res., Nov. 7 (R.M.C.).

GOLDEN PLOVER *Charadrius apricarius*

G. Max. count of 35, Slimbridge, Dec. 28 (P.J.C.).

S. Inland records for Jan.–Mar. and Oct.–Dec. include 200, Saltford area, Jan. 23 and Mar. 14 (P.T.S.); 110, Marksbury, Feb. 14 (B.K.); 20, Queen Charlton, Nov. 6 (D.W.); *c.* 160 on school playing field, Hartcliffe, Bristol, Dec. 8 (M.E.K.) and up to 120, Chew Valley res., Oct. 17–Dec. 7th. Max. coastal counts: 500, Axe Estuary, Feb. 27 (R.A.) and 500, Weston Bay, Sept. 19 (P.C.).

TURNSTONE *Arenaria interpres*

G. and **S.** Up to eight reported from coastal localities, all months; seventeen, New Grounds, Sept. 14 (L.P.A., M.A.O. *et al.*).

JACK SNIPE *Lymnocryptes minimus*

S. Up to four, Chew Valley res., Jan.–mid. Apr. (R.L., B.E.S. *et al.*) and three, Oct.–Dec. (R.A., M.L.D. *et al.*). Single birds, Sand Bay, Jan. 17, Dec. 25 (T.B.S.); Yeo Estuary, Mar. 7 (M.K.).

WOODCOCK *Scolopax rusticola*

G. One, Filton Golf Course, Nov. 17 (R.A.).

S. Single birds, Wraxall Piece, Failand, Jan. 3 (R.H.P.); Court Wood nr. Clevedon, Jan.–Feb. (K.B.Y.), Dec. 25 (N.B.); Shipham, Oct. 23 (G.C.B., S.I.B.); Chew Valley res., Nov. 6 (B.K.), Dec. 28 (R.A.); Barleycombe Wood, Loxton, Nov. 21 (B.R.G.); Chew Stoke, Nov. 22, Dec. 1 (D.E.L.); and Velvet Bottom nr. Cheddar, Nov. 27 (C.G.). Seventeen flushed from woods, Clapton-in-Gordano, Nov. 27 (3, Bay and Warren Wood; 4, Court Wood; 6, Norton's Wood; 4 in kale field) (N.B. per M.K.).

WHIMBREL *Numenius phaeopus*

G. and **S.** Recorded on both passages. One calling, Brean Down, on early date of Apr. 3 (M.K., D.S.). Max. counts—inland: six, Chew Valley res., May 7 and fifteen, Shipham, Aug. 13; coastal: 20, Woodspring Bay, May 2 and ten, same place, Aug. 8 (P.J.C., W.L.R., T.B.S. *et al.*).

BLACK-TAILED GODWIT *Limosa limosa*

G. and **S.** January records: one, Chew Valley res. on 10th (P.J.C., M.A.W. *et al.*) and fourteen, Axe Estuary on 17th (B.E.S.). Mar. 14–May 23: up to four, coast and Chew Valley res. June 26–Oct. 2: up to four, coast, but eight, New Grounds, June 26, and 22, same place, Aug. 30; up to four, resrs., July.

BAR-TAILED GODWIT *Limosa lapponica*

G. and **S.** New Grounds: three, Mar. 28; up to 40, Apr. 28–May 16; over 70 moving N., Apr. 29; single birds, June 7 and July 26–Aug. 27 (L.P.A.). Other coastal records, New Passage to Axe Estuary: up to four, Jan.–Nov., but fifteen, Weston Bay, Jan. 9 and seven, same place, Feb 21 (R.A.). Chew Valley res.: up to two, Jan. and Feb.; one, May 1; two, Sept. 6 (20 observers).

GREEN SANDPIPER *Tringa ochropus*

G. New Grounds: two, July 1–Aug. 30; single birds, Sept. 26 (caught in decoy), Oct. 16 (L.P.A.).

S. Chew Valley res.: up to twenty, July–late Aug., and single birds late Aug.–late Sept.; one, Dec. 11 (R.J.P.). Single birds, Barrow Gurney resrs., Apr. 7 (T.B.S.) and Orchardleigh Lake, July 16 (R.M.C.). Twelve, Stoke Moor, Sept. 4 (D.S.). One, Blagdon res., Sept. 7 (P.J.C.).

WOOD SANDPIPER *Tringa glareola*

G. One, New Grounds, Sept. 18 (L.P.A.).

S. Chew Valley res.: single birds, Apr. 12 (M.L.D., P.R.), July 18 (A.H.D., W.J.S.), Aug. 27 (P.R.), and Sept. 5 (D.S.); at least two, calling at dusk, July 30 (R.J.P.). Two, Blagdon res., Sept. 19 (R.L.).

COMMON SANDPIPER *Tringa hypoleucos*

G. and **S.** City of Bristol: R. Avon, Sea Mills, up to two, Jan.–May and July–Dec., but eight, Sept. 5 (J.F.R., K.B.Y. *et al.*). Reservoirs and coast: small numbers, Feb. 7–end June (max. of eight, Chew Valley, Apr. 27); larger numbers July and Aug. to peaks of 26, New Grounds, July 26 and *c.* 30, Chew Valley, Aug. 15; small numbers, Sept.–Dec. 5 with max. of five, Cheddar res., Sept. 12 (L.P.A., J.A.McG., W.L.R. *et al.*).

REDSHANK *Tringa totanus*

G. and **S.** Breeding season reports include: up to three pairs, Chew Valley res.—no young seen but one nest located, May 9 (W.J.S.); two pairs, Yeo Estuary—one chick seen, May 30 (T.B.S.), is first evidence of successful breeding since 1962. Coastal flocks: apparent further decline in late winter (max. reports 35, Weston Bay, Feb. 14 and Sand Bay, Feb. 20) but autumn flocks largest since 1961 (max. 150, Sand Bay, Sept. 26).

SPOTTED REDSHANK *Tringa erythropus*

G. New Grounds: reported, July–Sept., with maxima of three, July 29, ten, Aug. 25, fifteen, Sept. 8, 23 on 9th and twelve on 21st (L.P.A.).

S. Few records. One, Chew Valley res., May 1 (R.M.C.); up to two, July 21–Sept. 18 (R.J.S., K.E.V. *et al.*). Two, Sand Bay, Aug. 31 (R.A.).

GREENSHANK *Tringa nebularia*

G. New Grounds: one, May 1–12; up to four, July; seven, Aug. and nine, Sept. 19 (L.P.A.). One, New Passage, Aug. 18 (R.A., C.A.P.).

S. Max. counts show drop to pre-1962 levels. Spring: up to two, Chew Valley res.; up to four on coast. Return passage (July 3–Oct. 9): maxima of seven, Chew Valley res., July 28 (P.R.); eight, Stoke Moor, Sept. 4; one, Newton Park Lake, Oct. 1 (A.A.C.). No coastal records.

KNOT *Calidris canutus*

G. New Grounds: eight, Mar. 28; fifteen, May 13; sixteen, July 25–Aug. 26; twelve, Aug. 29–Sept. 6; eight, Sept. 14 (L.P.A., M.A.O.).

S. No reservoir records. Coastal packs: 1955–59, annual maxima ranged 122–290; 1960–64, 1,000–5,000; 1965, max. of 400, Mar. 2 and 300, Nov. 14, Dec. 14 and 19th (R.A., P.C., B.K. *et al.*).

PURPLE SANDPIPER *Calidris maritima*

S. One on rocks, Brean Down, Jan. 3 (E.A.M.).

LITTLE STINT *Calidris minuta*

G. and **S.** Three, New Grounds, Aug. 30 (L.P.A.). Single birds, Chew Valley res., May 1 (R.M.C.), July 24 (R.A.).

CURLEW SANDPIPER *Calidris testacea*

G. and **S.** One, New Grounds, Sept. 22 (L.P.A.). Sand Bay: two, May 16 (almost complete breeding plumage) and one, Sept. 5 (R.A., T.B.S.).

RUFF *Philomachus pugnax*

G. and **S.** Max. counts: up to 30, Chew Valley res., Mar. 31—Apr. 4 (K.B.Y. *et al.*); 22, Stoke Moor, Sept. 12 (B.R.). 41 records.

AVOCET *Recurvirostra avosetta*

G. Two, New Grounds, June 29 (L.P.A.).

BLACK-WINGED STILT *Himantopus himantopus*

S. Two, one ad., one imm., Chew Valley res., May 22–25 (J.B., J.G.C., R.F.T. *et al.*). Record, first for area since 1938, accepted by *Brit. Birds* Rarities Committee.

GREY PHALAROPE *Phalaropus fulicarius*

S. One, Chew Valley res., Sept. 19 (R.M.C., P.T.S. *et al.*).

RED-NECKED PHALAROPE *Phalaropus lobatus*

S. One, imm., Blagdon res., Sept. 18–27 (P.J.C. *et al.*). Conclusive details supplied.

LESSER BLACK-BACKED GULL *Larus fuscus*

S. Roost counts, Chew Valley res.: 130, Mar. 24; 100, Apr. 5; 300, Nov. 13; 130, Dec. 28 (B.K.).

HERRING GULL *Larus argentatus*

S. Roost counts, Chew Valley res.: 1,000, Nov. 13; 600, Dec. 28 (B.K.).

ICELAND GULL *Larus glaucoides*

G. and **S.** One, first-year, R. Avon nr. Temple Gate, Bristol, Mar. 18, identified and fully described by G.S., also seen by A.S., also near same place on 27th (J.F.R.).

LITTLE GULL *Larus minutus*

S. Chew Valley res.: up to two, Aug. 15–22 (R.A.). Cheddar res.: one juv., one imm., Sept. 12 (J.A.McG., B.R.); up to four imms., Nov. 27–Dec. 12 (R.M.C., B.K. *et al.*).

BLACK-HEADED GULL *Larus ridibundus*

S. Roost counts: Weston Bay—3,500, Feb. 27; 3,000, Sept. 29 (R.A.); 2,500, Oct. 23; 2,000, Dec. 5 (P.C.); Chew Valley res.—2,000, Feb. 14; 5,000, Nov. 13; 7,000, Dec. 28 (B.K.). 700 (25% with oiled plumage), Barrow Gurney res., Mar. 6 (R.J.P.).

KITTIWAKE *Rissa tridactyla*

S. One off Steep Holm after S.W. gale, Aug. 21 (Res. Stn.). Imm., Blagdon res., Aug. 28 (T.B.S.).

BLACK TERN *Chlidonias niger*

G. and **S.** Twelve, Chew Valley res. on early date of Apr. 10 (B.K.). Passage movement, May 1—twenty-nine or more, Blagdon res. (K.L.F. *et al.*); three, Chew Valley res. (R.M.C.) and ten over river, New Grounds (L.P.A.). Return movement, July 17–Oct. 3, generally only small numbers but large passage, Chew Valley res., mid-August—24, Aug. 9, 100–200, Aug. 10 and at least 600 on 11th but none, Blagdon res. (H.H., K.E.V., D.W.).

COMMON TERN *Sterna hirundo* ARCTIC TERN *Sterna macrura*

G. and **S.** Single birds, Cheddar res., Apr. 1 (J.A.McG.) and Chew Valley res. on 20th (A.H.D.). North-east movement with Black Terns, May 1—twenty-three, New Grounds (L.P.A.), sixteen, Blagdon res. (P.J.C. *et al.*) and 35, Chew Valley res. (R.M.C.). Return passage June 7–Oct. 2, with peak Sept. 18, when counts from reservoirs totalled *c.*100: 38, Blagdon; 18, Cheddar; 40, Chew Valley (B.E.S,. R.J.S. *et al*).

SANDWICH TERN *Sterna sandvicensis*

G. Three ads. over Severn, New Grounds, July 17, and one, Aug. 7 (L.P.A.).

LITTLE TERN *Sterna albifrons*

G. One over river, New Grounds, Apr. 30 (L.P.A.).

S. Three, Chew Valley res., Sept. 1; *c.* twelve, same place, on 11th (M.L.D., M.P., P.R.) and one on 25th (R.A., B.E.S.). One, Blagdon res., Sept. 25 (R.A., B.E.S.).

GUILLEMOT *Uria aalge*

S. Single birds found dead, Sand Bay, Jan. 17 and Weston Bay, Mar. 16 (R.A.). One, Weston Bay, Nov. 28 flew strongly towards Brean (P.C.).

STOCK DOVE *Columba oenas*

G. Reported from Filton, Mar.–Sept. and Blaise Castle, April (R.A.).

S. Winter flocks of 35 to 55, Jan. and Feb. (P.J.C., A.H.D., B.K.). Forty records in breeding season from Brean Down, Weston, Cheddar, Goblin Combe (four pairs), reservoirs, Leigh Woods, Bath area and Orchardleigh (R.A., R.M.C., M.K. *et al.*).

COLLARED DOVE *Streptopelia decaocto*

G. and **S.** Breeding reported from Weston, Clevedon and Bristol; very few young, New Grounds, June (R.A., J.F.B., M.A.O., A.J.T.). Total now estimated at over 550 (P.J.C.).

CUCKOO *Cuculus canorus*

G. and **S.** A total of 63 records from 33 different localities, almost all below 400 ft. contour. Juv. in nest of Reed Warbler, Chew Valley res., June 21 (A.E.B.); another with Dunnock fosterers, Filton, Aug. 12–27 (R.A.) and one fed solely by pair of Wrens, Blaise Castle, July 29 (R.A., C.A.P.). Juv., Shipham, July 31 (T.B.S.) and one, Brean Down, Sept. 5 (R.A.).

BARN OWL *Tyto alba*

G. and **S.** One, Congresbury, Feb. 2 (R.A.) and one, Whitchurch, Mar. 19, 29 (R.J.S., K.E.V.); two, Saltford, Mar. 22 (B.K.). Single birds: Langford, Apr. 11 (D.W.); Barrow Gurney resrs., July 22 (J.E.A.); Chelwood, Aug. 31 (R.M.C.); Hunstrete, Oct. 13 (D.W.); Filton, Oct. 25 (R.A.) and Weston, Oct. 28 (R.A.). Seventeen reports of single birds from Chew Valley res., Jan., Mar.–May and Sept. until end of year with three, Dec. 31 (M.P., P.R.).

LITTLE OWL *Athene noctua*

G. One found dead, Hambrook, Jan. 28 (R.H.P.) had considerable fat deposits 'surprising in mid-winter'. Single birds, Shirehampton, Apr. 1 (C.L.) and Filton, Nov. 22 (R.A.).

S. Reports from 24 localities. Pair with three young, Brean Down, June 30 (R.A.).

TAWNY OWL *Strix aluco*

G. Reports from sixteen localities in and near City of Bristol, Jan.–Oct. (C.G., R.J.P. *et al.*).

S. Records from over twenty localities (including nine additional to last year), seven in Bath area (R.M.C.) and eight peripheral to Blagdon res. and Chew Valley res. (R.J.P., D.W. *et al.*). Ad. sitting on four eggs on ground, Weston Wood, Apr. 9, four young on 30th, three large young, May 8, nest empty on 21st, presumed young flew successfully (R.A.). One young, Cadbury Camp, May 12 (H.W.N.).

SHORT-EARED OWL *Asio flammeus*

S. One, Sand Point, Mar. 27 (C.G.).

NIGHTJAR *Caprimulgus europaeus*

S. One heard, Mendip Lodge, Apr. 23 (D.J.P.); three or four, Abbots Leigh, June 4 (D.J.P.) and one, nr. Clevedon, June 17 (K.B.Y.).

SWIFT *Apus apus*

S. First noted, Weston, Apr. 30 (R.A.); *c.*100, Chew Valley res., May 1 (R.M.C.). One, Brean Down, Sept. 5 (R.A.).

KINGFISHER *Alcedo atthis*

G. and **S.** Reports (110) from twelve localities, Mar.–August, include R. Avon at Sea Mills and St. Anne's. Post-breeding records from seventeen localities, including twelve (eleven juvs.) ringed Chew Valley res. (C.V.R.S.) and four, Newton Park (B.R.G.).

HOOPOE *Upupa epops*

G. One, Stapleton, July 26–Aug. 3 (H.G.H., A.T.).

S. Single birds, Sand Point, May 23, 24 (D.J.P.) and Aug. 14, 15 (R.A.).

GREEN WOODPECKER *Picus viridis*

S. Over sixty records from 38 localities (twenty-nine, 1964), all months. Breeding reported from Worlebury (R.A.) and Shipham (T.B.S.).

GREAT SPOTTED WOODPECKER *Dendrocopos major*

G. City of Bristol records: single birds, Redland, June 23 (C.G.) and Eastville Park, Dec. 21 (R.H.P.).

S. At least four pairs, Leigh Woods, May–June (P.J.C.). Reports from 28 localities, all months.

LESSER SPOTTED WOODPECKER *Dendrocopos minor*

G. Single birds, Downend, Apr. 20 (M.L.D., P.R.), Wick, Dec. 6 (D.R.H.) and Filton, Dec. 14 (R.A.).

S. One or two, Chew Stoke, four dates, Jan.–Nov. (D.E.L.); one, Midford, Feb. 7 (R.M.C.) and one, Ubley, Mar. 7, 21, Sept. 19 (P.J.C.), where breeding reported, June (J.A.McG.); two, Leigh Woods, Apr. 9 (P.R.); single birds, Chew Valley res., June 20 (J.A.McG.) and Long Ashton, June 29–July 9 (G.E.C.); two, Butcombe, Nov. 24 (R.L.).

WOODLARK *Lullula arborea*

S. Single birds, Saltford, June 7 (B.K.); Steep Holm, Sept. 26 (Res. Stn.) and Sand Point, Oct. 25 (T.B. per R.A.).

SAND MARTIN *Riparia riparia*

S. First migrants, Chew Valley res., Mar. 24 (E.A.M.) with max. of *c.* 400 there, July 25 (C.V.R.S.); 40, Brean Down, Apr. 3 (M.K.). Up to ten pairs, usual wall drain sites, Batheaston (A.A.C.) and Keynsham (per S.M.T.); pair in wall drain, Litton (D.W.).

RAVEN *Corvus corax*

G. New Grounds: one, Feb. 4, June 7, 8; four (2 ads., 2 juvs.), June 15–July 18 (L.P.A., M.L.); one, Aug. 24; two, Sept. 18; one, Oct. 19 and one found dead, Nov. 16 (M.A.O.).

S. Two, Cheddar, Jan. 9 (D.S.). Reports of up to four, Brean Down, Feb.–Sept., where pair bred (R.A. *et al.*). Two, Blagdon, Sept. 12 (K.E.V.); one, Chelvey, Sept. 23 (H.H.D.); four, Cheddar Wood, Sept. 26 (M.K.); three, Shipham, Oct 22 (G.C.B., S.I.B.); two, Weston Wood, Oct. 29 (R.A.) and two, Shipham, Nov. 12 (T.B.S.).

JACKDAW *Corvus monedula*

S. 4,000–5,000 gathering to roost, Blagdon res., Feb. 6, 21 (R.J.P.).

LONG-TAILED TIT *Aegithalos caudatus*

G. and **S.** Records from Pucklechurch, Oakford nr. St. Catherine, Blaise Woods, Leigh Woods, Cadbury Camp, Clevedon, Goblin Combe, Blagdon and Chew Valley resrs. (R.A., R.M.C. *et al.*).

BEARDED TIT *Panurus biarmicus*

S. Five, Brean Down, Oct. 10 (R.A., F.W.B., G.F.G.H.); three, Sand Bay, Oct. 25 (R.A.). Reported, Chew Valley res., Oct. 17–end of year; 35 ringed out of estimated total of *c.* 50; two controls of birds ringed, Portland, just before (C.V.R.S.). First records for N. Somerset since 1861—cf. *Proc. B.N.S.*, 1947, p. 236.

WREN *Troglodytes troglodytes*

G. and **S.** Still not back to pre-1963 numbers everywhere although recovery apparently continues.

DIPPER *Cinclus cinclus*

S. Single birds, Shockerwick, Jan.–Nov. (A.A.C., R.M.C.) and Combe Hay, Apr. 8 (R.M.C.). Four, Midford, Oct. 24 (R.M.C.).

Ring Ouzel *Turdus torquatus*

S. Four (3♂♂), Goblin Combe, Apr. 4 (M.K.). Single birds, Brean Down, Apr. 24 (T.B.S.); Sand Point, Sept. 12 (R.A.); Goblin Combe, Sept. 25 (M.K.); Shipham, Oct. 4 (T.B.S.) and Dolebury Warren, Oct. 12 (G.C.B., S.I.B.).

Stonechat *Saxicola torquata*

G. Immature male, Filton Golf Course, Sept. 28 (R.A.).

S. At least two pairs reared young, Brean Down (T.R.J.W. *et al.*). Five (four juvs.), Sand Bay, Aug. 6 (R.A.); single ♂, Steep Holm, Sept. 28 (Res. Stn.) and nine, Brean Down, Nov. 14 (P.J.C., M.A.W.). Winter records, Chew Valley res., Blagdon res. and Velvet Bottom, Mendip.

Whinchat *Saxicola rubetra*

G. and **S.** Breeding season reports from Chew Valley res. (R.A., K.E.V. *et al.*) and Charterhouse (J.F.B., R.D.O.). Autumn records: two, Rode, Aug. 27 (G.L.B.); one, Brean Down, Aug. 31 (R.A.); three, Filton Golf Course, Sept. 7 (R.A.); two, Yeo Estuary, Sept. 19 (M.K.), and two, Sand Bay, Sept. 26 (R.A.).

Redstart *Phoenicurus phoenicurus*

G. and **S.** Bred, Clifton Down (R.V.C.). Three pairs in breeding season, Oakford (A.A.C.); one, Chew Valley res., May 1 (C.V.R.S.); three singing males, Goblin Combe, June 7 (M.K.) and nest with young, Oakford, June 13 (A.A.C.).

Black Redstart *Phoenicurus ochruros*

S. Female, Long Ashton, Apr. 16 (G.E.C.) and ♀ or imm., Brean Down, Oct. 17 (B.E.S.).

Nightingale *Luscinia megarhynchos*

G. and **S.** Singing ♂♂ reported from Frampton Cotterell, Oakford and Leigh Woods (C.A.P., R.H.P. *et al.*).

Grasshopper Warbler *Locustella naevia*

G. Count of nine singing, Oakford, May 17 (A.A.C.).

S. Singing birds noted, Walton Moor, Sand Point, Weston Wood, Brean Down, Steep Holm, Wrington Warren, Rowberrow Warren, Priddy, Burrington, Chew Valley res. and Saltford.

REED WARBLER *Acrocephalus scirpaceus*

G. and **S.** Breeding records: Littleton-upon-Severn—estimated twelve pairs (P.J.C., C.L.) and Chew Valley res. (D.W.).

AQUATIC WARBLER *Acrocephalus paludicola*

S. One trapped, Chew Valley res., Aug. 15 (C.V.R.S.). Record accepted by *Brit. Birds* Rarities Committee.

WHITETHROAT *Sylvia communis*

S. Juv. ringed (AK69296), Blagdon res., July 17, killed, Concelho de Bragança, Portugal, Aug. 24 (P.J.C.).

LESSER WHITETHROAT *Sylvia curruca*

G. and **S.** Breeding season records from Filton, Weston-in-Gordano, Yeo Estuary, Sand Bay, Uphill, Cheddar Gorge, Shipham, Breach Hill, Chew Valley res. and Limpley Stoke.

CHIFFCHAFF *Phylloscopus collybita*

G. Winter records, probably this species: Weston-s-Mare, Jan. 3 (R.A.) and Chew Valley res., Dec. 24–28 (G.A.B., M.E.B.). One ringed, Steep Holm, Sept. 28, found dead, Vergara (Guipúzcoa), Spain, Oct. 22 (Res. Stn.).

WOOD WARBLER *Phylloscopus sibilatrix*

G. Single birds, Oakford, May 2 (R.M.C.); Blaise Woods, June 23; Filton, July 30 (R.A.).

S. Singing ♂♂ reported from Leigh Woods, Clevedon, Goblin Combe, Weston Wood, Shipham, Dolebury Warren, Burrington Combe, Charterhouse, Mendip and Bath.

ARCTIC WARBLER *Phylloscopus borealis*

S. One, Sand Bay, Aug. 17 identified by C.G.B. who describes it as Wood Warbler size, very active, with dark greenish suffused grey brown upperparts, very long prominent white eye-stripe, off-white underparts, single narrow whitish wing bar and pale legs. Record accepted by *Brit. Birds* Rarities Committee.

GOLDCREST *Regulus regulus*

S. Ad. ♀ ringed (AN19328), Shipham, 4/10/64, controlled 225m. N.W., Copeland, C. Down 14/4/65 (T.B.S.).

FIRECREST *Regulus ignicapillus*

S. One, Weston Wood, Nov. 11 (T.B.)—conclusive details supplied.

PIED FLYCATCHER *Muscicapa hypoleuca*

G. Single ♀ or imm., Downend Wood, Aug. 9 (M.L.D., P.R.); juv. ♂, Clifton, Aug. 11 (P.J.C.) and one ♀ or imm., Filton, Aug. 26. Sept. 10 (R.A.).

S. Single ♂, Weston, Apr. 14 and two on 30th (R.A., D.J.P.); single ♂♂, Leigh Woods, Apr. 15, 22 (R.C.); pair, same place, May 16 (C.G., V.E.G.); one, Goblin Combe, April 17 (D.E.L., R.L.) and pair on Mendip, May 7, 9 (P.C., D.J.P.).

TREE PIPIT *Anthus trivialis*

G. and **S.** Pair bred, Leigh Woods (P.J.C.)—the only record. Reports (10) from ten localities, May and June (15 observers).

WATER PIPIT *Anthus spinoletta spinoletta*

S. Cheddar res.: one or two, four dates, Jan. (J.A.McG., T.B.S.); single birds, Feb. 6 (B.K.), Feb. 14, Mar. 14, Apr. 1 (J.A.McG.), Nov. 26 (T.B.S.) and two, Nov. 27 (R.M.C.). Chew Valley res.: one or two, Feb.–Mar. (P.J.C., B.K., J. A. McG.) and Oct.–mid. Dec. (R.M.C., B.K., J.A.McG.); one ringed, Jan. 24, similar to *A. s. petrosus* but with pale whitish underparts (C.V.R.S.). Some reports suggest *A. s. littoralis* rather than this race.

PIED WAGTAIL *Motacilla alba yarrellii*

S. Large roost (max. count 198) in greenhouse, Cheddar, Aug.–Sept. (M.K.); 53, Chew Valley res., Oct. 9 (D.E.L.).

WHITE WAGTAIL *Motacilla alba alba*

S. Up to three, Cheddar res., April (R.M.C., J.A.McG.) and one, Blagdon res., Apr. 24 (R.M.C.).

BLUE-HEADED WAGTAIL *Motacilla flava flava*

S. Single ♂, Chew Valley res., May 23 (G.S., W.J.S., R.F.T.).

WAXWING *Bombycilla garrulus*

G. Two, Stoke Bishop, Bristol, Dec. 9 (M.B. per S.M.T.).

S. Three, Wrington Warren, Nov. 21 (M.K.); two, Clevedon, Dec. 11 and one, Hartcliffe, Bristol, December (C.W.H., M.L.—*Bristol Evening Post*, Dec. 22, 23, 1965).

HAWFINCH *Coccothraustes coccothraustes*

S. Six, Leigh Woods, Apr. 7 (R.A.); ten, Goblin Combe, Sept. 12 (M.K., K.S.).

SISKIN *Carduelis spinus*

G. Single birds, Filton, several dates, October (R.A.); two, Brandon Hill, Bristol, Oct. 20 (R.D.O.).

S. Autumn and winter parties: 12, Blagdon res., Jan. 4 (H.W.N.); 30, Chew Valley res., Mar. 6 (D.E.L.); four, Steep Holm, Oct. 3 (Res. Stn.); 12, Brean Down, Oct. 23 (M.P., P.R.); 12, Velvet Bottom, Mendip, Oct. 23 and *c.*20, Shipham, Nov. 19 (T.B.S.). Single birds and up to six together widely reported.

TWITE *Carduelis flavirostris*

G. One, Sea Mills Harbour, Nov. 17 (H.W.N.).

S. Two, Yeo Estuary, Nov. 14 (A.H.D., M.K. *et al.*); nine, Clevedon coast, Nov. 20 (B.K.).

REDPOLL *Carduelis flammea*

G. Ten, Filton, Oct. 19 (R.A.); four, New Grounds, Oct. 27 (L.P.A.); seven, Brandon Hill, Bristol, Nov. 5 (R.D.O.).

S. Reports of singles or parties up to 35 from nine coastal and inland localities including reservoirs, Feb.–early May and Oct.–end of year (16 observers). One larger, paler bird, Chew Valley res., Oct. 31 (K.L.F., D.S.) and another, same place, Nov. 1 (P.R.).

CROSSBILL *Loxia curvirostra*

S. Single birds, Blagdon res., Feb. 14 (R.M.C.), Goblin Combe, Oct. 24 (M.K.) and Loxton, Nov. 21 (B.R.G.).

BRAMBLING *Fringilla montifringilla*

G. and **S.** Reports of up to 60 from twenty localities, Jan.–Mar., Oct.–early Dec. (20 observers).

CORN BUNTING *Emberiza calandra*

S. Single birds, Sand Bay, Feb. 7 (R.A.), Stanton Prior, nr. Bath, Apr. 7 (R.M.C.) and East Dundry, Apr. 15 (D.W.).

CIRL BUNTING *Emberiza cirlus*

G. Pair, Horseshoe Bend, Shirehampton, May 15 (H.W.N.) and three there, June 8 (J.F.R.).

S. Breeding season records: singing ♂♂, Portbury, Sand Point, Weston Woods, Crook Peak, Cheddar res. and Cheddar Wood (R.A., M.K., R.J.S. *et al.*).

LAPLAND BUNTING *Calcarius lapponicus*

S. Single birds, Yeo Estuary, Mar. 7 (M.K.) and Mar. 14 (K.L.F.). One, Sand Point, Oct. 24 (R.A.).

SNOW BUNTING *Plectrophenax nivalis*

G. Four, Royal Drift, nr. Purton, Dec. 26 (per C.M.S.).

TREE SPARROW *Passer montanus*

G. and **S.** Reports from twelve separate localities, Jan.–Mar., Sept.–end of year. Parties of 60, Bannerdown, Jan. 10 (A.A.C.); 67, Cheddar Moor, Mar. 13 (E.A.M.) and 24, Cheddar res., Oct. 31 (H.H.). Two pairs, Marshfield and Chew Valley res., May–June (R.M.C., W.J.S.).

SPECIES REPORTED BUT NOT INCLUDED IN THE SYSTEMATIC LIST:—

Residents: Little Grebe, Heron, Mute Swan, Moorhen, Snipe, Curlew, Great Black-backed Gull, Skylark, Carrion Crow, Rook, Jay, Magpie, Great Tit, Blue Tit, Coal Tit, Marsh Tit, Nuthatch, Treecreeper, Mistle Thrush, Song Thrush, Blackbird, Robin, Dunnock, Meadow Pipit, Greenfinch, Goldfinch, Linnet, Bullfinch, Chaffinch, Yellow Bunting, Reed Bunting.

Summer or Winter Visitors and Passage Migrants: Oystercatcher, Turtle Dove, Swallow, House Martin, Fieldfare, Redwing, Wheatear, Sedge Warbler, Blackcap, Garden Warbler, Willow Warbler, Spotted Flycatcher, Yellow Wagtail.

LEPIDOPTERA NOTES
BRISTOL DISTRICT, 1965
BUTTERFLIES

BY J. E. COOPER

THE quantity of records has substantially increased this year so notes on the commoner species are summarized here. Full details of all records received are kept on a permanent card index which includes observations submitted too late for inclusion in this report.

1965 was a good year for butterflies and few species seemed to suffer from the wet weather in July and August. Few migrants were reported: for example, *Colias croceus* Fourc. (Clouded Yellow) was not recorded, while the numbers of *Vanessa cardui* L. (Painted Lady) were considerably lower than in previous years. No records were received of *Hamearis lucina* L. (Duke of Burgundy Fritillary) or *Cupido minimus* Fuessl. (Small Blue).

Contributors were: R. Angles (R.A.), C. S. H. Blathwayt (C.S.H.B.), A. Brown (A.B.), J. F. Burton (J.F.B.), Mrs. S. Buxton (S.B.), Miss A. M. Clough (A.C.), J. E. Cooper (J.E.C.), D. Cullen (D.C.), R. M. Curber (R.M.C.), H. H. Davis (H.H.D.), Miss E. Eakins (E.E.), D. J. Foxwell (D.J.F.), D. G. Gibb (D.G.G.), J. G. Gibb (J.G.G.), Miss I. F. Gravestock (I.F.G.), D. R. Hamblett (D.R.H.), M. Kendall (M.K.), Mrs. M. Knight (M.Kt.), Mrs. R. Lovell (R.L.), K. H. Poole (K.H.P).), T. & M. Silcocks (T.&M.S.), C. W. Wiltshire (C.W.W.), G. Winn (G.W.), Mrs. G. A. Winn (G.A.W.), and Miss D. Withers (D.W.).

Unless otherwise stated, notes refer to adult insects. More records of other stages would be valuable. The area covered by this report consists roughly of Gloucestershire south of a line from Slimbridge to Tetbury, and Somerset north of the Parrett Estuary and the Polden Hills: a few records for localities just outside these boundaries are also given.

G. refers to Gloucestershire,

S. to Somerset.

Pararge aegeria L. (Speckled Wood)

1965 was a good year and reports refer to many localities. The earliest records were of a fresh male at Pill on May 13 (J.F.B.) and a specimen at Coombe Dingle on April 10 (A.B.). The first generation probably made a good start, though records for May and June were somewhat low. The second generation appeared mainly at the end of August, with sightings through

Sept. to the first week of October. A few very late specimens were seen up to the end of Oct.; the last record was of two at Filton on Oct. 29 (R.A.).

G. Numerous at Filton and in Bristol (Coombe Dingle and Clifton) and elsewhere.

S. Common in its usual localities such as Leigh Woods, Blagdon, Shipham, Goblin Combe and Meare Heath. C.S.H.B. reports that in N. Somerset it was not quite as frequent as in 1964.

Pararge megera L. (Wall Brown)

Less common than in 1965 with no records from **G.**

S. Wick St. Lawrence: 2, Aug. 22 (T.&M.S.); Westhay: *c.* 4, Aug. 31, 2, Sept. 2 (T.&M.S.); Walton Hill: 2–3, Sept. 9 (T.&M.S.); Windmill Hill: 1, Sept. 1 (T.&M.S.); Brean Down: 1, on Aug. 15 and 3 on Aug. 31(R.A.); Weston Woods: 2, in field, June 6 (K.H.P.); Weston-s-Mare: 1, Aug. 29 (K.H.P.); Crook Peak to Shute Shelve: 2 in 3 hours, June 12 (K.H.P.); Shipham: 3, Sept. 1 (K.H.P.); Goblin Combe: 1 on June 7 and 3 on June 20 (M.K.); Publow: 1, May 23 (D.C.).

Melanargia galathea L. (Marbled White)

Records continue to be received for this species from both **G.** and **S.** In many localities it appears fairly plentiful.

G. Numerous records from Stinchcombe in July (D.G.G.) and reported as "fairly common in early June" in this locality (D.R.H.). Kingsweston Down: 1, July 7 (R.A.); Almondsbury: 1, July 18; 3, July 31 (D.G.G.); Woodhouse Down: 3, July 18 (J.G.G.); nr. Wickwar: many, July 18 (D.G.G.).

S. Nr. Draycott: 1, Aug. 12 (D.G.G.); Crook Peak: 1, Aug. 15 (T.&M.S.); Meare Heath: plentiful locally, July 24 (J.F.B.); Goblin Combe: "fairly plentiful," July 18 (A.B.); Sand Point: 15 in 5 minutes, June 27, 1, July 25 1, Aug. 1 (R.A.); Brean Down: 1, July 4 and 12 on July 17 (R.A.); Shapwick: 5, July 10 (R.A.); several at rest at night, July 2 (K.H.P.); Loxton Hill, many seen, July 16 (S.B.); Cadbury Camp Ridge: 1, July 9 (H.H.D.); Brockley Combe: "very small colony compared with 1964" (D.J.F.); Blagdon Lake: mass emergence on July 3, a total of 337 being counted on west bank of the dam, *c.* 200 in field bordering N. shore July 4, *c.* 300 counted July 10, abundant July 17 and 2 only on July 31 (M.K.), several in the evening, July 9 (R.L.).

Eumenis semele L. (Grayling)

S. Goblin Combe: fairly plentiful on higher ground, July 18 (A.B.); Draycott area: 2, Aug. 4 (D.G.G.); Sand Point: 1, July 25; 1, Aug. 1 and 8 (R.A.); Brean Down: 1, Aug. 15 (R.A.); Brockley Combe; numerous, Aug. 7 (D.J.F.).

Maniola tithonus L. (Hedge Brown)

G. Tortworth: several in worn condition, Aug. 25 (D.G.G.); Henbury Golf Course, 1, June 5 (C.W.W.); Wick: "fair numbers" in 1965 (D.R.H.).

S. Blagdon: several, July 31 (T.&M.S.), 6, July 31 (M.K.); Shipham: 1–2, Aug. 7, several, Aug. 8, 1, Aug. 14 (T.&M.S.); Crook Peak: common, Aug. 15 (T.&M.S.); Puxton Moor: 2, Aug. 25 (T. & M.S.); Westhay: 5+, Aug. 31 (T.&M.S.); one fresh male, July 24 (J.F.B.); Walton Hill: *c.* 3, Sept. 1 (T.&M.S.); Shapwick Heath: 1, Sept. 2 (T.&M.S.); Chew Valley Lake: 1, Sept. 4 (T. & M.S.); Cadbury Camp: 2, Sept. 6 (T.&

M.S.); many, Aug. 14 (H.H.D.); 1 worn male, Sept. 9 (J.F.B.); Sand Point: 1, Aug. 8 and 29 (R.A.); Pill: 1, Aug. 30 (J.F.B.); Yatton: 1, Sept. 12 (H.H.D.); Brockley Combe: several, Aug. 7 (D.J.F.).

Maniola jurtina L. (Meadow Brown)

The first records were from Henbury Golf Course on June 5 (C.W.W.) but observers reported it in reasonable numbers during July and Aug. with some late specimens into Oct. The species appeared to have a good year in both **G.** and **S.**

Coenonympha pamphilus L. (Small Heath)

Records were few but indicate relative abundance in some localities. In other areas it appears to be rare or absent.

G. Wickwar: "common," June 12 (D.G.G.); Filton Golf Course: 1, July 1 (R.A.); Henbury Golf Course: 1, July 3 (C.W.W.).

S. Shipham: 1, July 29 (T.&M.S.), numerous on 'The Roughet,' Shapwick, June 15 (J.F.B.); Goblin Combe: fairly plentiful, July 18 (A.B.); *c.* 12, June 7 and abundant, June 20 (M.K.); Sand Point: 1, June 7 and 26 (R.A.); Brean Down: 1, June 8 (R.A.); Brockley Combe: several, May 30 and June 2 (D.J.F.); Charterhouse: common on June 11, June 30 and July 1 (D.J.F.); The Mineries, Priddy: several, June 30 and July 1 (D.J.F.); Dolebury Hill: common in June (J.E.C.).

Aphantopus hyperanthus L. (Ringlet)

Records were again few but included two from localities in **G.**; *hyperanthus* seems fairly common in certain areas.

G. Stinchcombe: several, July 19 (D.G.G.); Wickwar: plentiful, July 4 (A.B.).

S. Meare Heath: very common, July 24 (J.F.B.); Westhay Moor: common, July 24 (J.F.B.); Goblin Combe: fairly plentiful, July 18 (A.B.), 2, July 31 (M.K.); Brockley Combe—Goblin Combe: several, July 31 (K.H.P.); Brockley Combe: several, Aug. 7 (D.J.F.); Leigh Woods: several, Aug. 7 (D.J.F.); Blagdon Lake: *c.* 30 on S. and W. shores, July 10 (M.K.).

Argynnis selene L. (Small Pearl-bordered Fritillary)

S. Charterhouse: numerous, June 11, June 30 and July 1 (D.J.F.); The Mineries, Priddy: numerous, June 30 and July 1 (D.J.F.).

Argynnis euphrosyne L. (Pearl-bordered Fritillary)

G. Wickwar: a few, June 12 (D.G.G.).

S. Weston-s-Mare (Weston Woods): "searched for on 11 May . . . but not seen" (K.H.P.); Brockley Combe: 1, June 2 (D.J.F.); Goblin Combe: 2, June 7 and 4, June 20 (M.K.); Leigh Woods: 1 female, June 4 (D.J.F.); "none seen on various visits in June" (J.E.C.).

Argynnis aglaia L. (Dark-green Fritillary)

G. Stinchcombe: 2, July 19 (D.G.G.).

S. Shipham: 1, Aug. 27 (T.&M.S.); Goblin Combe: fairly common, July 18 (A.B.); Brean Down: 1, June 20, 6, July 4 and 6, July 17 (R.A.); Brockley Combe—Goblin Combe: 2 (var. *charlotta*), July 31 (K.H.P.).; large worn colony, Aug. 7 (D.J.F.).

Argynnis cydippe L. (High Brown Fritillary)

S. Goblin Combe: 1, July 31 (K.H.P.); "fairly common," July 18 (A.B.)·

Argynnis paphia L. (Silver-washed Fritillary)

S. Cadbury Camp Ridge: 1, July 5 and 1, Aug. 8 (H.H.D.); Loxton Hill: 1, July 16 (S.B.); Goblin Combe; fairly common, July 18 (A.B.).

Euphydryas aurinia Rott. (Marsh Fritillary)

G. Nr. Wickwar: numerous, June 6 (D.G.G.).

S. Nr. Glastonbury: "in fair numbers in its usual locality," June 5 (C.S.H.B.); The Mineries, Priddy: 1 pupa, May 26 and 1 worn female, July 1 (D.J.F.). Charterhouse: large colony, June 11 (D.J.F.); Blagdon Lake: 8 on E. shore of Butcombe Bay, June 5 (M.K.).

Vanessa atalanta L. (Red Admiral)

This species did not appear in such large numbers in the area as in 1964, though records of one or two specimens were received from various localities. **G.** records were from Wickwar, Stoke Bishop, Tortworth, Westbury-on-Trym and Filton. Many localities in **S.** were recorded with a particularly large number of sightings in Shipham during Aug. and Sept. The last seen was a specimen in Weston-s-Mare on Oct. 16 (K.H.P.).

Vanessa cardui L. (Painted Lady)

Very few records were received of this immigrant, and from both Weston-s-Mare, **S.**, (C.S.H.B.) and Wick, **G.**, (D.R.H.) it was specifically mentioned as being absent in 1965.

S. Shipham: 1, on *Buddleja*, Aug. 18 and 1, Aug. 20 (T.&M.S.); West Sedgemoor: 1, June 26 (R.A.).

Aglais urticae L. (Small Tortoiseshell)

This butterfly had another very good year and large numbers of records were received from both **G.** and **S.** The first reports were in early March —1 adult flying actively over deep snow at Wick (D.R.H.) and 1 at Filton (R.A.), both on March 9, while the earliest reports of the year were of 1 at Almondsbury, March 2 (D.G.G.) and an adult crawling on the pavement in Park Street, Bristol, on March 3 (I.F.G.). Both generations were large, with the second generation tailing off in Oct.; the last records were on Oct. 25—at Charfield (M.Kt.); Weston-s-Mare (K.H.P.) and Shipham (S.B.) with stragglers on Nov. 3 and 11 at Shipham (T.& M.S.).

Nymphalis io L. (Peacock)

Probably commoner than in 1964, the earliest reports from both **G.** and **S.** being on Mar. 27 (A.B., K.H.P., D.C., C.W.W.). Specimens were seen in reasonable numbers until the end of May. The second generation was large and substantial records were received for Aug. and Sept. The last seen were on Oct. 4 and 5 at Pill (J.F.B.).

Polygonia c-album L. (Comma)

The first emerging adults seen were in the last few days of March but numbers were small until the end of July and Aug. when several were reported. Records were generally sporadic, and this butterfly appears to have been less successful than in 1964.

G. Wickwar, Westbury-on-Trym, Tortworth, Coombe Dingle, Almondsbury, Filton, Wick, Clifton and Charfield.

S. Meare Heath, Pill, Shipham, Blagdon, Kewstoke, Weston-s-Mare, Cadbury Camp, Goblin Combe, Uphill and Leigh Woods.

Aricia agestis Schiff. (Brown Argus)

G. Henbury Golf Course: 1, June 5 (C.W.W.).

S. Shipham: 1, Aug. 30; 1, Sept. 27 and reported as late as Oct. 14 and 17 (T.&M.S.); Walton Hill: 2, Sept. 1 (T.&M.S.); Goblin Combe: a few, July 18 (A.B.); Cheddar: many, June 20 (C.W.W.); Brockley Combe: 1, June 2 and 1, Aug. 7 (D.J.F.); Wrington: 1, June 2 (D.J.F.).

Polyommatus icarus Rott. (Common Blue)

This butterfly appeared to have a good year, with records from many localities. Most were seen in June, July and Aug., though some as late as the end of September.

Lysandra coridon Poda (Chalkhill Blue)

G. Coombe Hill, Wotton-under-Edge: 3–4 freshly emerged, Aug. 6 (D.G.G.); Stinchcombe: a few, freshly emerged, Aug. 6 (D.G.G.).

S. Nr. Draycott; a few, freshly emerged, Aug. 4 and fairly numerous on Aug. 12, but the locality has been recently ploughed (D.G.G.); Brean Down: 1, Aug. 8 and 15 (R.A.): fairly common from late July until mid Sept. in its usual haunts in N. Somerset (C.S.H.B.).

Lysandra bellargus Rott. (Adonis Blue)

G. Charfield: 1, May 13, also 1 on Aug. 7 and 14 (M.Kt.); Inglestone Common: "about 6 pairs feeding on Birdsfoot Trefoil" May 13 (M.Kt.).

S. Cheddar: 1 male, June 20 (C.W.W.).

Celastrina argiolus L. (Holly Blue)

An increased number of records received included some from near Bristol (J.G.G., A.B., C.W.W.). Possibly the butterfly is on the increase.

S. Cadbury Camp Ridge: 1, May 12, 21 and 23, and 1, Aug. 14 (H.H.D.); Weston-s-Mare: "in garden in both spring and summer broods in 1965 . . . I had not seen it for a few years" (C.S.H.B.), 1 in Park, May 11, 1 in town on June 18 and Aug. 8 (K.H.P.).

Lycaena phlaeas L. (Small Copper)

Locally abundant in various areas in **S.**, but seen in only five areas in **G.** and there in small numbers.

G. Almondsbury, Henbury Golf Course, Tortworth, Charfield and Coombe Dingle.

S. Goblin Combe, Brockley Combe, Charterhouse, Shipham, Wick St. Lawrence, Westhay, Walton Hill, Shapwick Heath, Cadbury Camp, Sand Point, Tadham Moor and Blagdon.

Callophrys rubi L. (Green Hairstreak)

G. Wickwar: a few, worn, June 12 (D.G.G.).

S. Priddy: quite plentiful, June 13 (A.B.); 1, May 26 (D.J.F.); Brockley Combe: 1, June 2 (D.J.F.).

Thecla quercus L. (Purple Hairstreak)

G. Henbury Golf Course: 2 larvae found on oak trees in early June (C.W.W.).

S. Shipham: 1 on beech, Aug. 8 (T.&M.S.); Leigh Woods: several larvae beaten from oak in early part of June (J.E.C.); 3, beaten oak, June 4 (A.B.); several adults, Aug. 7 (D.J.F.); Westhay Moor: several fresh flying around young oaks in hedgerow, July 24 (J.F.B.); Brockley Combe: several, Aug. 7 (D.J.F.).

Strymonidia w-album Knoch (White-letter Hairstreak)

G. Almondsbury: one with damaged hindwing, Aug. 14 (D.G.G.); Coombe Dingle: an adult caught on bramble, July 18 (A.B.); Henbury Golf Course: 1, July 20 (C.W.W.).

S. Weston Woods: "one wych elm searched, and 2 larvae found," June 2 (K.H.P.).

Pieris brassicae L. (Large White)

G. and **S.** Both broods present in moderate numbers, the former recorded mainly in May and early June, latter up to mid-October.

Pieris rapae L. (Small White)

Common in both **G.** and **S.** during the season from mid-April to mid-October.

Pieris napi L. (Green-veined White)

G. and **S.** Records from several areas showed this species had a good year with both broods in considerable numbers.

Anthocharis cardamines L. (Orange-tip)

First seen Coombe Dingle, April 16 (A.B.). Reports from both **G.** and **S.** showed that it was fairly abundant in several localities.

Gonepteryx rhamni L. (Brimstone)

A good year with many records from several localities in **G.** and **S.** First seen on March 11 in Clifton (C.W.W.); the last on Oct. 14 at Charfield (M.Kt.).

Erynnis tages L. (Dingy Skipper)

G. Nr. Wickwar: common, June 12 (D.G.G.); Henbury Golf Course: 2, June 5 (C.W.W.); St. Michael's Wood: 1, July 4 (C.W.W.).

S. Crook Peak—Shute Shelve: 4 in 3 hours, June 12 (K.H.P.); Priddy: 1, May 26 (D.J.F.); plentiful, June 6 (A.B.); Brockley Combe: 1, June 2 (D.J.F.); Leigh Woods: several, June 5 (D.J.F.); Charterhouse: 1, June 11 and 30 (D.J.F.); Blagdon: 3, June 5 (M.K.); Goblin Combe: 2, June 7 and *c.* 6, June 20 (M.K.).

Pyrgus malvae L. (Grizzled Skipper)

G. Wickwar: several, June 12 (D.G.G.); 1, July 4 (A.B.).

S. Priddy: quite plentiful, June 13 (A.B.); Yatton: 1, May 31 (H.H.D.); Brockley Combe: 1, June 2 (D.J.F.); Charterhouse, 1, June 11 (D.J.F.).

Thymelicus sylvestris Poda (Small Skipper)

G. Almondsbury: 2, Aug. 14 (D.G.G.); Wickwar: plentiful, July 4 (A.B.); St. Michael's Wood: many, July 4 (C.W.W.).

S. Draycott: 1–2, Aug. 12 (D.G.G.); Shipham: 1, Aug. 14 and 27 (T.& M.S.); Crook Peak: common, Aug. 15 (T.&M.S.); Meare Heath: common, July 24 (J.F.B.); Goblin Combe: fairly plentiful, Aug. 18 (A.B.); 2, July 31 (M.K.); Brockley Combe: common, Aug. 7 (D.J.F.); Leigh Woods: several, Aug. 7 (D.J.F.).

Ochlodes venata Br. & Grey (Large Skipper)

G. Wickwar: numerous, June 12 (D.G.G.); plentiful, July 4 (A.B.); Stoke Bishop, fairly plentiful in 1965—also at Durdham Down and Henbury Golf Course (A.B.); Filton: 2, June 30 (R.A.); Clifton area: 1, June 22 (C.W.W.); Henbury Golf Course: 1, July 3 (C.W.W.); St. Michael's Wood: several, July 4 (C.W.W.); Wick: a few in 1965 (D.R.H.).

S. Pill: female in garden, June 26 (J.F.B.), male in garden, Aug. 7 (J.F.B.); Priddy, quite plentiful, June 13 (A.B.); Goblin Combe: fairly plentiful, Aug. 18 (A.B.); Leigh Woods: many seen, June 19 (C.W.W.); Ashton Park: reasonable numbers in June (J.E.C.); Weston-s-Mare: 1, June 27 and 30 (K.H.P.); Charterhouse: several, July 1 (D.J.F.); Priddy: several, July 1 (D.J.F.); Blagdon: 4, June 5 and *c.* 8, June 19 (M.K.).

MOTHS

By K. H. Poole

FROM the records received it would appear to have been a poor year for moths, and migrant species have been few.

The following notes have been taken from those supplied by C. S. H. Blathwayt (C.S.H.B.), Master A. Brown (A.B.), J. F. Burton (J.F.B.), J. E. Cooper (J.E.C.), G. H. W. Crutwell (G.H.W.C.), D. G. Gibb (D.G.G.), K. H. Poole (K.H.P.) and J. B. Silcocks (J.B.S.).

Unless otherwise indicated single specimens have been recorded, and those taken at light marked by an asterisk.

Sphinx ligustri L. (Privet Hawk). Weston-s-Mare, May 21* (C.S.H.B.) (normal pink markings replaced by white).

Celerio livornica Esp. (Striped Hawk). Almondsbury, May 21, 27* (D.G.G.). Clapton-in-Gordano, early June, Master P. Williams and C. Martin (per *Clevedon Mercury*, June 5).

Harpyia furcula Cl. (Sallow Kitten). Almondsbury, June 19, 29* (D.G.G.).

Stauropus fagi L. (Lobster). Almondsbury, June 27* (D.G.G.).

Tethea octogesima Hübn. (Figure of Eighty). Stoke Bishop, June 15, 26, 27, July 10* (A.B.). Milton, Weston-s-Mare, June 11* (K.H.P.).

Trichiura crataegi L. (Pale Oak Eggar). Almondsbury, Sept. 22* (D.G.G.).

Epicnaptera ilicifolia L. (Small Lappet). Weston-s-Mare, May 15 (W. T. Acland). Found at rest, 4 p.m., Lower Church Road, on the outside of a breeding cage. This species is regarded as extinct in Britain, though a larva was reported from Porlock in 1938.

Phragmatobia fuliginosa L. (Ruby Tiger). Pill, Aug. 2 (J.F.B.).

Apatele alni L. (Alder Moth). Leigh Woods, June 6* (J.E.C.).

Cryphia muralis Forst. (Marbled Beauty). Shipham, Aug. 11, 21* (J.B.S.).

Agrotis ripae Hübn. (Sand Dart). Milton, Weston-s-Mare, June 11* (K.H.P.).

Lycophotia porphyrea Schiff. (True Lover's Knot). Stoke Bishop, Aug. 9* (A.B.).

Graphiphora augur Fab. (Double Dart). Milton, Weston-s-Mare, June 26* (K.H.P.).

Amathes baja Schiff. (Dotted Clay). Milton, Weston-s-Mare, July 30* (K.H.P.).

Luperina testacea Schiff. (Flounced Rustic). Henbury, Sept. 15* (A.B.).

Xylophasia hepatica Hübn. (Clouded Brindle). Stoke Bishop, June 15* (A.B.).

Stilbia anomala Haw. (The Anomalous). Weston-s-Mare, Aug. 27* (C.S.H.B.).

Panolis flammea Schiff. (Pine Beauty). Milton, Weston-s-Mare, May 5* (K.H.P.).

Zenobia subtusa Schiff. (Olive Kidney). Almondsbury, Aug. 9* (D.G.G.).

Anchoscelis litura L. (Brown-spot Pinion). Henbury, Sept. 15* (A.B.).

Dasycampa rubiginea Schiff. (Dotted Chestnut). Frome, Mar. 10* (G.H.W.C.).

Xylena vetusta Hübn. (Red Swordgrass). Milton, Weston-s-Mare, April 23* (K.H.P.).

Phytometra viridaria Cl. (Small Purple Barred). Shipham, June 15* (J.F.B.).

Polychrisia moneta Fab. (Golden Plusia). Stoke Bishop, June 27, 30, July 3* (A.B.).

Plusia iota L. (Plain Golden Y). Stoke Bishop, July 3* (A.B.).

Herminia barbalis Cl. (Common Fan-foot). Weston-s-Mare, Aug. 10* (C.S.H.B.).

Sterrha trigeminata Haw. (Treble Brown Spot). Stoke Bishop, July 9, 13, 18* (A.B.).

Scopula immutata L. (Lesser Cream Wave). Westhay Moor, several, July 24 (J.F.B.).

Cosymbia punctaria L. (Maiden's Blush). Stoke Bishop, Aug. 13* (A.B.).

Cosymbia linearia Hübn. (Clay Triple-lines). Milton, Weston-s-Mare, June 2* (K.H.P.).

Cosymbia pendularia Cl. (Birch Mocha). Stoke Bishop, Aug. 18* (A.B.).

Larentia cervinalis Scop. (Mallow). Shipham, Oct. 4* (J.B.S.).

Calocalpe undulata L. (Scallop Shell). Westhay Moor, July 24 (J.F.B.).

Philereme transversata Hufn. (Dark Umber). Milton, Weston-s-Mare, Aug. 9* (K.H.P.).

Discoloxia blomeri Curt. (Blomer's Rivulet). Leigh Woods, June 3* (J.E.C.).

Perizoma bifasciata Haw. (Barred Rivulet). Weston-s-Mare, Aug. 13* (K.H.P.).

Eupithecia tripunctaria H.–S. (White-spotted Pug). Leigh Woods, June 6 (J.E.C.).

Ellopia prosapiaria L. (Barred Red). Stoke Bishop, July 18, Aug. 13* (A.B.).

Selenia lunaria Schiff. (Lunar Thorn). Almondsbury, June 7* (D.G.G.).

Semiothisa liturata Cl. (Tawny Barred Angle). Wickwar, July 4, Stoke Bishop, Aug. 13* (A.B.).

Lycia hirtaria Cl. (Brindled Beauty). Weston-s-Mare, end of April, commoner than usual* (C.S.H.B.).

THE COMMON GULL IN THE SEVERN ESTUARY IN RELATION TO FEEDING AREAS, ROOST SITES AND BEHAVIOUR

BY J. D. R. VERNON AND T. P. WALSH

INTRODUCTION

CROOK (1953) and Hickling (1957) studied some aspects of gull behaviour in winter flocks mainly in relation to feeding and roosting, with particular reference to the Black-headed Gull (*Larus ridibundus*). The present study relates specifically to the Common Gull (*Larus canus*), notably its roosting sites, feeding areas and behaviour.

The Common Gull occurs in winter in very large numbers on the Severn Estuary and since 1956 detailed observations have been made to determine the distribution and behaviour of this population. During early summer the only Common Gulls present are a few non-breeding birds, and of these fewer still come inland to feed, but from July onwards gulls begin to reappear on the estuary. They arrive in increasing numbers as the autumn advances to reach a peak generally during November–December. A second peak occurs in February–March probably due to an influx of birds on passage, after which numbers fall away rapidly, few remaining after the end of April. Throughout the autumn and winter the majority fly inland during the day to feed mainly on the upland areas of the Cotswolds and, to a lesser extent, to inland areas of Herefordshire; though small numbers remain on the river sand-banks when the tide is sufficiently low. Later in the day the inland feeding flocks return to roost communally on the sand-banks of the Severn.

Radford (1960) analysed the ringing recoveries of Common Gulls in the British Isles. Of these recoveries only 19 have been in the Severn Estuary area and all were of continental origin. Seven were birds ringed as young in Norway, four in Sweden, two in Estonia and three each from Denmark and North Germany. Many further recoveries will be needed before the nesting areas of this wintering population can be determined exactly, though the results of Radford's analysis suggest that the vast majority of Common Gulls found in the autumn and winter in England and Wales are indeed of continental origin, coming mainly from Scandinavia and North

Germany. Continental birds probably occur in winter in Scotland and Ireland, together with locally bred birds, but apart from a few recoveries of Scottish bred birds in the north of England and a few Irish bred birds in west Wales there is as yet no indication that any gulls wintering in England and Wales originate from the Irish and Scottish colonies.

ROOST SITES AND DISPERSAL AREAS

The main roost on the Severn Estuary occurs on sand-banks between Purton and Frampton-on-Severn some ten miles south of Gloucester, whilst subsidiary roosts are found at Oldbury-on-Severn six miles further south, and at the mouth of the river Avon (Bristol).

The Frampton roosting site varies in position because of the constant alterations in the river channels. Its chief occupants are Common Gulls and a maximum of 25,000 has been recorded using the roost. It is also shared by some 500 Black-headed Gulls (*Larus ridibundus*) and a few Herring Gulls (*L. argentatus*) and Greater Black-backed Gulls (*L. marinus*) (Hickling, 1960).

The dispersal area, or 'dispersal system' (Crook, 1953), of Common Gulls from the Frampton roost is very wide, and was investigated in some detail over the winters 1956–62. Almost the whole roost breaks up at first light, well before sunrise, though the actual time depends to a considerable extent on the light intensity. Within half an hour the roost is deserted, apart from a few birds which remain and loiter on the sand-banks in the river throughout the day. The majority of the birds fly inland to many parts of the compass, but the dispersal is not haphazard and marked flight lines (Fig. 1) are adhered to each day, to and from the feeding areas. The return flight occurs in the late afternoon usually commencing an hour or two before sunset. Broadly speaking, nine main flight lines can be distinguished:

(1) northwards parallel to the Cotswold ridge across the City of Gloucester and thence to an area just north of Gloucester on the lower areas of the north Cotswolds;

(2) northwards to areas around Dymock and Newent and as far north as Ledbury in Herefordshire;

(3) northwestwards over the river to inland areas around the upper reaches of the rivers Wye and Lugg, around Hereford;

(4) again northwestwards over the river to upland areas just west of the Forest of Dean and probably including areas around Monmouth and in southwest Herefordshire;

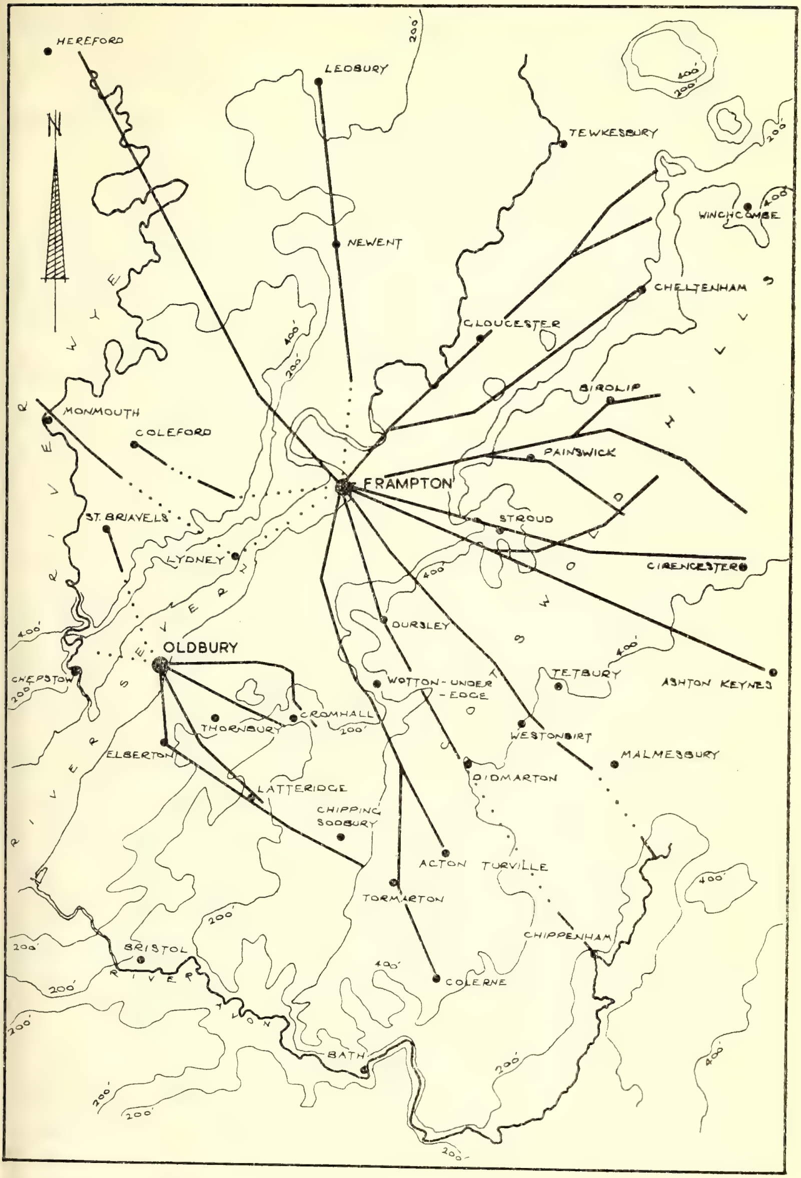
N
HEREFORD
LEDBURY
TEWKESBURY
WINCHCOMBE
NEWENT
CHELTENHAM
GLOUCESTER
BIRDLIP
PAINSWICK
MONMOUTH
COLEFORD
FRAMPTON
STROUD
ST. BRIAVELS
LYDNEY
CIRENCESTER
RIVER WYE
RIVER SEVERN
COTSWOLD HILLS
OLDBURY
CHEPSTOW
DURSLEY
WOTTON-UNDER-EDGE
TETBURY
ASHTON KEYNES
CROMHALL
THORNBURY
WESTONBIRT
MALMESBURY
ELBERTON
DIDMARTON
LATTERIDGE
CHIPPING SODBURY
ACTON TURVILLE
TORMARTON
CHIPPENHAM
BRISTOL
RIVER AVON
COLERNE
BATH
200'
400'

FIG. 1. *Flight lines of the Common Gull* (Larus canus) *traced to and from the Oldbury and Frampton roosts.*

(5) southwards, following the Cotswold ridge to Hawkesbury-Upton, and thence to feeding areas on top of the south Cotswolds around Tormarton, Marshfield and to Colerne (Wiltshire);

(6) southwards to the Dursley valley, and from there to the Cotswolds up to Didmarton and probably as far south as Chippenham (Wilts.);

(7) southwards across the Cotswold ridge to Westonbirt and the Tetbury area, and as far south as Malmesbury (Wilts.). When the river Avon is in flood the flight line continues as far south as Seagry (Wilts.) where the gulls are attracted to the flood meadows;

(8) eastwards up the Stroud valley, and thence along the north ridge of the valley to an area around Cirencester;

(9) eastwards, following the ridge to Birdlip, and thence inland over the ridge to feeding areas on the Cotswolds as far west as Bibury.

The Oldbury-on-Severn roost, as noted, is used only by a comparatively small number of Common Gulls. The numbers in mid-winter vary a great deal from year to year ranging from a maximum of 1,000 to 350. The roost is shared with Black-headed Gulls which may constitute up to 50% of gulls present. As at Frampton, few Common Gulls remain on the estuary during the day, but fly inland from the roost along four or five well marked flight lines to the lower slopes of the south Cotswolds around Wickwar and Chipping Sodbury, though there is little or no movement on to the top of the wold. Some gull flocks feeding in upland areas to the west of the Forest of Dean may also use this roost.

The roost at the estuary of the Avon is primarily used by Black-headed and Herring Gulls but up to 1,000 Common Gulls (approximately 10% of total) occur during the autumn and winter, maximum numbers being reached in December–January. This roost has been studied in some detail by Chadwick and Poulding (1956). Since 1954, when an inland roost at Chew Valley lake 12 miles to the south-east of the Avon roost in Somerset came into existence, numbers have considerably decreased and now rarely more than 300 Common Gulls use the roost. During the day these flight out to feeding areas on the extreme southern slopes of the Cotswolds, and the upland limestone areas around Failand, Tickenham and the Backwell and Dundry Hill areas, all to the south of Bristol, in Somerset. A few are found with the Black-headed Gull flocks feeding on the Avon as far up as Bristol, though larger groups of up to 200 Common Gulls have been noted on the Avon at the end of March and in April; these are probably migrant birds (Tetley, 1935). Small groups of Common Gulls are also seen resting and feeding within the city of Bristol on some of the larger and more upland recreational grounds.

CHOICE OF HABITAT

Along each flight line from each of these roosts certain fields or groups of fields are used by Common Gulls as feeding areas and for preening and resting. The fields chosen are generally well grazed short-term leys or permanent pastures, usually flat and of some 10–15 acres in size, and many are used regularly year after year. Recreation grounds are also much frequented, and stubble fields may occasionally be used as resting places. By contrast, Hickling (1957), in his study of wintering gulls, found that small fields were used in preference to large ones. The population he was studying comprised mainly Black-headed Gulls which may be the reason for the difference. During the autumn and later in the early spring, when grassland and cereal stubbles are ploughed, large flocks of up to 1,000 Common Gulls congregate and follow the plough, feeding on exposed insect larvae and earthworms. They rarely remain, however, for more than one or two days after ploughing. Other feeding areas are used regularly, in most cases, throughout the late summer to early spring, and there is a gradual move from one field to another away from the roosting site from early morning until about mid-day when the return movement towards the roost begins. This means that on most days some feeding flocks are present on the majority of the feeding areas along a particular flight line, though the ones nearest the roost may be empty of birds around noon. Generally, flocks consist almost entirely of Common Gulls with occasionally a few Black-headed Gulls, though this rarely exceeds 5% of the total. When flooding occurs in winter, mixed flocks of the two species are frequently found on flood meadows where an abundant supply of food is available in the form of earthworms which have been washed out of their burrows. Apart from such instances, the two species occur in separate flocks. Occasionally Lesser Black-backed Gulls (*Larus fuscus*) are also to be seen with the flock, their numbers being highest in July and August, indicating passage of birds from nesting areas.

It is of interest to compare the feeding habitats of the Common Gull in the Severn Estuary area with those of the Black-headed Gull which uses the same roosts. In contrast to the Common Gull, few Black-headed Gulls venture high up on to the upland areas of the

Cotswolds save for the birds within the Common Gull flocks. By far the majority of Black-headed Gulls feed on the lowland areas of the Severn vale, either on the mud flats of the river, or, as with Common Gulls, on grass and ploughed fields. Comparatively few Common Gulls use these lowland areas and the few present on the river during the day are generally on the sand-banks rather than on the mud flats. These differences in habitat, which have been noted in some other parts of the country, and have been remarked upon by Hickling (1954, 1957), may possibly be correlated with a difference in food or range of food taken.

PROPORTION OF FIRST YEAR BIRDS IN WINTER FLOCKS

In mid-winter the number of first year birds within the Common Gull flocks feeding inland rarely exceeds, on average, 6%. In late July, and in August, when the first birds return to the estuary the flocks frequently consist entirely of adults, but the proportion of first year birds within flocks gradually increases to an average of 5·6% in January (Table 1). In March the proportion rises perceptibly due either to the movement out of adult birds to the continent or to a movement in of first year birds from other areas or a combination of both factors. By May, the few remaining flocks consist almost entirely of first year birds. A more extensive series of counts will be needed to substantiate these results.

TABLE 1

Month	No. of records	Immatures as approx. % of total
August	16	0·3
September	4	0·5
October	10	0·7
November	13	2·9
December	16	3·2
January	18	5·6
February	9	2·9
March	7	9·4
April	1	86·0
May	3	96·5

BEHAVIOUR OF FEEDING FLOCKS

As a result of detailed observations made throughout the day at a number of sites, the behaviour of feeding flocks is found to follow a well defined pattern. Flocks arriving in the very early morning at the nearest feeding areas to the roost vary in numbers from 100–200 to as many as 3,000. The birds sometimes descend without hesitation but usually circle the area cautiously, gradually losing height until one bird alights, to be followed instantly by most of the flock, while others fly steadily on overhead to feeding grounds further inland. Other birds arriving from the roost join the feeding flock without hesitation. Circling and landing is accompanied by much calling. There is considerable 'mewing' and 'kee-ah, kee-ah', utterance coming apparently more from immature birds, if these are present, than from adults. Calling largely ceases once the gulls have landed, and voracious feeding immediately commences. The flock moves as a single unit in one direction over the field, walking almost at a trot—with frequent short 'leap frogging' flights, presumably to reach unexplored ground a few feet ahead. Earthworms are dragged out of the ground, and other forms of food are apparently taken from the surface. Probing of the ground in the first hour of feeding has been roughly timed on a number of occasions, and averages, in the first ten minutes, five times per minute. After about 30 minutes the rate of probing decreases noticeably to about once a minute. The movement of the flock gradually slows down to a sedate walk, and later still to a desultory stroll. Small parties take wing from time to time and fly to adjoining fields or go further inland. Of those that remain, most, after some 45–60 minutes, settle down to a period of resting and preening, re-congregating in small flocks of 20–30. During these periods they sit quietly, preen, stretch, or turn the head back and tuck the bill under the scapulars. Individual resting birds are sometimes seen to execute a gaping or yawning motion. After a period of from half to one hour restlessness develops and the resting flock breaks up, some birds resuming a rather idle ground search for food, others flying backwards and forwards over the ground, occasionally touching down for an instant to pick up a food trifle, and then resuming their searching flight. At this period also, should there be others on adjoining fields, there appears to be some visiting between the flocks, with consequent fluctuations in the numbers on different fields. This alternation between spells of resting and preening, rather idle foraging on the ground or from the air, and visiting or resettling on adjacent fields, forms the usual pattern for the rest of the morning and early afternoon.

Weather conditions may affect the general daily pattern to some degree. Heavy driving rain curtails the feeding periods, even immediately after arrival from the roost. In these conditions the birds soon huddle together in a very tightly packed flock, facing the rain with heads tucked back over the shoulders, remaining motionless until conditions improve. In fine weather, but when winds are strong, more time is spent searching over feeding grounds on the wing.

RETURN TO THE ROOST

Apart from small groups moving about in the vicinity of the feeding ground, there is little movement during the day from each feeding area until the light intensity begins to decrease. This may be as early as 13.00 hours in December, becoming gradually later as the days lengthen with the turn of the year and varying from day to day with weather conditions. At this point the first small groups take to the wing and fly off in the direction of the roost, though frequently returning to the feeding flock. They give the appearance of being divided between the impulse to be gone and the impulse to remain with the majority. Eventually, at about two hours before sunset, small parties definitely depart in the direction of the roost, to be followed by a continuous stream of returning birds until the passage ceases as daylight fades. At any point on a flight line, numbers returning to the roost will, at first, be small—two, three or four birds flying over in a leisurely fashion. These are followed by gradually increasing numbers which reach a peak about one hour after sunset, and tail away until perhaps two birds, or even a solitary one, is seen 'wending its homeward way' long after the main body of gulls has passed. This slow build up and then gradual decrease in numbers on the evening flight is in marked contrast to the early morning pattern when passage is much more concentrated, both in time and numbers. The return flight lines taken in the late afternoon appear to be the same as those followed outwards from the roost in the morning. The contours of the Cotswold valleys, especially well wooded slopes, are again followed closely, particularly when these run in a general direction towards the roost. It is possible that this is done to make use of rising air currents for gaining height, as well as for guidance. The formation in which the birds fly varies from day to day, apparently influenced by wind and the weather as Crook (1953) has described in some detail with reference to gulls in Southampton Water. If there is little wind, the birds fly generally in V or echelon formation, at other times roughly in line abreast over a front of 50 or 100 yards. In high winds such formations are not maintained and much use is then made of the wind for gaining height and gliding.

At both morning and evening flights the ability of the gulls to orientate is remarkable. Ground mist frequently obscures the feeding areas in the early morning, yet the gulls have been seen to come down through the mist on to the favoured field in the usual way. Distant haze, mist, or low, driving rain clouds may almost obliterate the surroundings in the evening. The gulls, however, pursue a steady, undeviating course towards the distant roost although, below the 700 foot contour line, the whole of the Severn vale may be shrouded in mist. On reaching the roost in the evening, incoming birds gradually lose height as they approach the river, and finally plane down to the surface of the water or to flat exposed sand-spits. A large proportion land in shallow water to bathe, before walking on to the sand-spits to join others already settled. Presumably, on ebb tides, they remain on the sand-banks in the centre of the estuary for much of the night. The turn of the tide in the estuary occurs very rapidly and with considerable force, rushing up deep channels and flooding over lower sand and mud banks, causing turbulent surface conditions. The gulls accordingly retreat from lower to slightly higher sand-banks and become more and more concentrated on the last uncovered spit. There may then be, at a conservative estimate, something in the region of 5,000–6,000 gulls on a narrow spit a few hundred yards long. When such a spit is finally covered, the gulls take to wing and scatter, but soon re-alight on the now smooth surface of the water over their original resting place. There is then much 'shuffle' flighting (Crook, 1953), followed by a gradual re-congregation on the smoothest part of the surface. The daily cycle may then be said to be complete.

SOME ASPECTS OF BEHAVIOUR WITHIN THE FLOCK

Within winter flocks, whether feeding or resting, there seems to be little aggressive behaviour, as Hickling (1957) found in his study of wintering gulls. Aggression is confined almost entirely to that period when the flock first alights on the feeding area. At this time a bird which has found food may, occasionally, be forced to move away from it, or with it, by other birds of the flock. Complete tolerance is shown to other species feeding on the same area, such as Starling (*Sturnus vulgaris*), Rook (*Corvus frugilegus*), Carrion Crow (*Corvus corone*), Magpie (*Pica pica*), and Pied Wagtail (*Motacilla alba*) as well as other gull species.

Quite often, however, a gull on the ground will adopt, first a hunched attitude, and will then lift the head and neck right up until almost vertical, and with bill wide open will utter, usually, two long 'keee' notes, followed by four or five staccato 'ka-ka-ka-ka' ones, the latter being given with the head thrust forward horizontally. This may be taken up and repeated by a bird or two near at hand for a moment or so. Though this behaviour pattern is one of display, it would appear to be part of the social behaviour in winter, as Darling (1938) has shown.

Apart from these, instances of individual aggression or mutual display are exceptional, only three having been observed during the study period.

In the first of these (February 1958) four birds were flying over and occasionally alighting on a feeding ground. One of the four persistently ran towards any other which alighted near it, once adopted a threat pose, and also chased the others in the air. This perhaps suggests incipient territorial behaviour.

In the second (August 1959) two out of three birds present were observed to walk side by side in the hunched attitude, and then with necks stretched vertically to call loudly in the manner described above. This appears to correspond closely with the 'hunched' posture and 'long' call described by Weidmann (1955) in his study of breeding season activities of the Common Gull. He further notes that the 'long' call is not confined to territory or breeding ground, since, even in the breeding season, its use was observed on feeding grounds some way away.

The third instance also occurred in the month of August (1963). Two adult birds among a very scattered flock of about 20 on a ten-acre recreation field drew attention by their loud and persistent calling. They were observed to walk about together at a fairly brisk pace, not feeding as the others were, and seldom moving more than 5 or 6 feet apart. The paths taken by these two birds sometimes described a rough circle of fairly wide radius, at others a kind of 'sentry-beat' for 10 or 15 yards. If one outdistanced the other, the rear bird increased its pace until the distance between them was again reduced to a foot or two. In the course of these parallel perambulations one bird frequently uttered a quiet 'khow-khow-khow' note, interspersed with an occasional thin, long 'wheeze', which may correspond to Wiedmann's 'choking' calls (*op. cit.*). The same bird, at frequent intervals walked close to the other, sometimes inclining its beak towards the ground and then walking with head and neck in a hunched, horizontal posture (cf. line drawings of female proposing to male, Tinbergen, 1953, pp. 106–107). Both birds then usually came to a stop, thrusting their necks forward, uttering a long 'keee' note, then throwing the neck and head up vertically and uttering, very loudly, several 'kee-ah, kee-ah, kee-ah' calls, usually 'accelerando', with the accent on the first syllable, and usually in time with each other, or nearly so. After one such bout of calling, one bird suddenly arched its neck in the 'upright threat' posture (Weidmann, *op. cit.*, p. 54), then lunged at the other, taking hold of feathers at the rear base of the neck. A considerable tussle ensued, with much buffeting of wings, to be broken off by one bird flying away, chased by the other. On alighting, the tussle was resumed. This flight chase and tussle were repeated three times in all. On one occasion, when fighting had momentarily ceased, a third bird alighted close by and walked between the two contestants. Otherwise the rest of the flock took no observable notice; indeed, before the encounter ended, they had all flown to an adjoining field, where they were shortly joined by these two birds. Seven hours later calling was again heard from this field, and two birds (possibly the same) were observed to go through the same pattern of parading, head lowering, horizontal and vertical head and neck movements, with calling, as before. This was continued for one hour, but without any fighting supervening, and on this occasion there were no other gulls present on the field. Boase (1952) records several instances of courtship display in the Herring Gull outside the breeding season and the editor's footnote to this paper quotes a record by C. F. Tebbutt of a 'wild flight' display by a Common Gull at Eltisley, Cambs. on 11 January, 1950.

SUMMARY

Between 1956–1963 a study was made of the distribution and behaviour of the Common Gull flocks wintering on the Severn Estuary. Few roost on the estuary during the summer, but from September onwards numbers increase rapidly and generally reach a peak in November–December—with a second peak in February–March. The gulls year by year use the same roosting sites on the river sand-banks and fly out to inland feeding areas in the early morning along predetermined flight lines, returning to the roost in the late afternoon along the same routes. The daily routine appears to be a regular one. The feeding areas used are mostly well grazed pasture land and playing fields; upland areas are much preferred. The number of immature birds in mid-winter rarely exceeds an average of 6%. The behaviour of the feeding flocks is described both to and from the roosts. It shows a pattern of alternate resting and feeding throughout the day, with little aggressive behaviour within the flock.

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OLIGOKYPHUS FROM HOLWELL QUARRY, SOMERSET

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INTRODUCTION

THE faunas of terrestrial vertebrates from Mesozoic fissure fillings in the Carboniferous Limestone of the Bristol Channel area are well known (e.g. Kühne 1947, 1949; Parrington 1947; Robinson 1957). One of the outstanding features of these faunas is the almost monospecific character of the fauna in each fissure system. Haramiyids (formerly microlestids) have been found only at Holwell Quarry; the mammal-like reptile *Oligokyphus* has been found only at Windsor Hill, near Shepton Mallet. The present discovery of *Oligokyphus* with haramiyids at Holwell is therefore of considerable interest.

GEOLOGY

The village of Holwell (Nat. Grid Ref. ST/727452) has two large, working quarries, one to the north (Qn) and one to the south (Qs) of the main Shepton Mallet—Frome road (A361). These quarries are in the *Seminula* (S1) zone of the Carboniferous Limestone, and are situated at the south-eastern edge of the Mendip Hills, lying on the southern margin of the east-west trending Beacon Hill pericline (Sibley 1906).

The limestone is exposed to maximum depths of about 40 feet in Qs, and about 70 feet in Qn. It dips to the south, steepening from 12° in Qn to 25° in Qs. The northern wall of Qn exposes a southerly plunging anticline, its limbs dipping east–west at 12°. The fossiliferous limestone in Qn contains plentiful brachiopods, corals, crinoids, and bryozoa; recently good silicified trilobite remains have been recovered. Qs is relatively unfossiliferous.

The top of the limestone is peneplaned, and lying on this surface are the Lias and Inferior Oolite. Reynolds (1912) gives the following description for the Marston Road Section of Moore (1867), which lies on the north side of the A361 about $\frac{1}{4}$ mile east of Holwell village.

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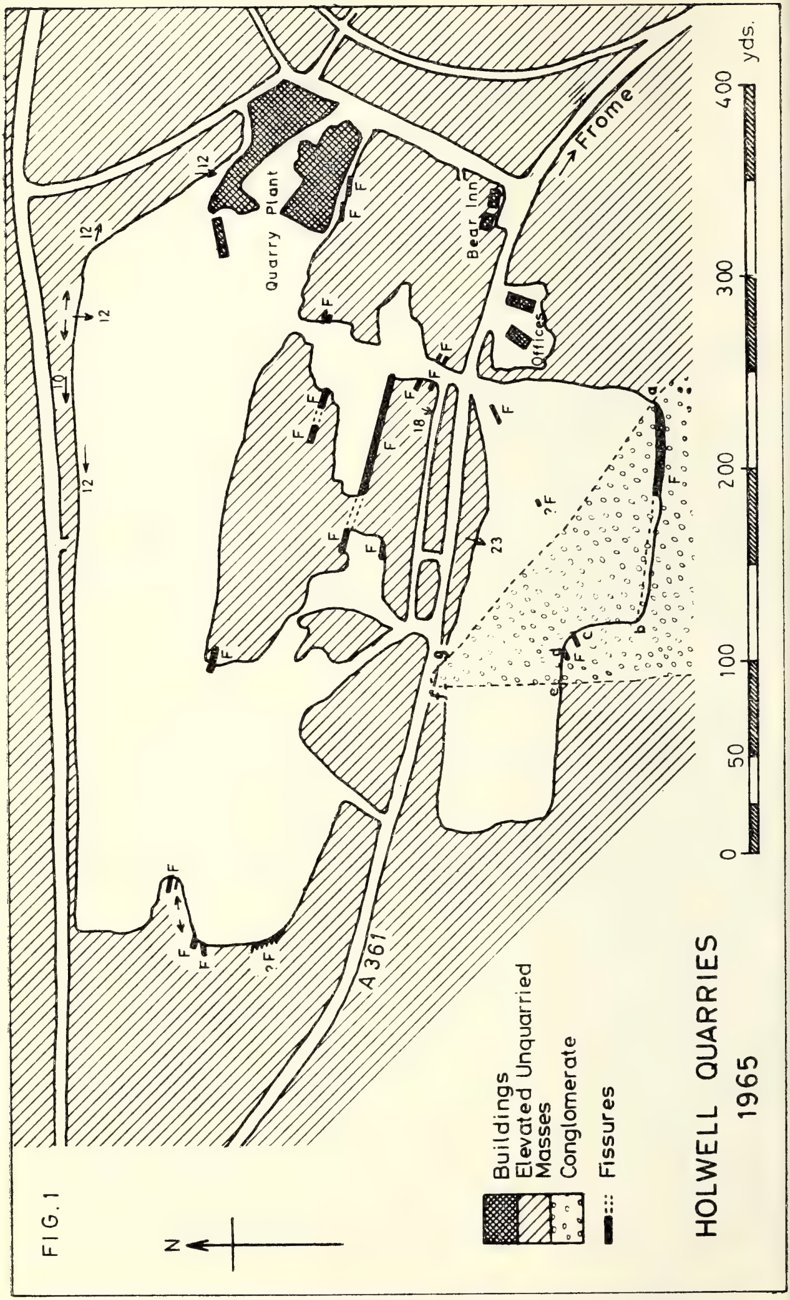

N
Buildings
Elevated Unquarried Masses
Conglomerate
Fissures
A361
Frome
Quarry Plant
Bear Inn
Offices
F
?F
12
10
18
23
a
b
c
d
e
f
g
0
50
100
200
300
400
yds.

FIG. 1

HOLWELL QUARRIES 1965

> "The line of junction between the Carboniferous Limestone and the Rhaetic is not always easy to see. Above the Rhaetic comes a crystalline representative of the Lias, a dense unstratified deposit several feet thick, and containing a fair number of fossils. The top bed of the Lias has been bored by Inferior Oolite *Lithodomi*, which may still be found occupying holes in its surface. At the top of the section are some two feet of rubbly Inferior Oolite, in which such characteristic fossils as *Rhynchonella* (*Acanthothyris*) *spinosa* may be found."

A detailed diagram and account of the succession are given by Richardson (1911). Reynolds' description applies fairly closely to the succession exposed at the north-western corner of Qn, except that the Rhaetic is not here present.

FISSURES

Fissures penetrate vertically into the limestone, and in the depth exposed by quarrying, their base is not seen. The accompanying map (Fig. 1) shows the fissures trending in a generally W.N.W. – E.S.E. direction. They vary in width quite considerably, and may even "wedge-out" in places, although this cannot be ascertained definitely. Where they become narrow they are thickly lined with calcite which grew inwards from the fissure walls in radiating clusters, often in the form of beef (sparry calcite), or the dog-tooth spar variety. In one fissure-geode an interesting form of dog-tooth spar was found, the top face of each horizontal scalenohedron being deeply excavated—probably a solution phenomenon.

Most fissures contain a mixture of a consolidated and unconsolidated infilling, generally grey-green when fresh, and yellow-green to brown when weathered. In these are many vertebrate remains, especially fish teeth.

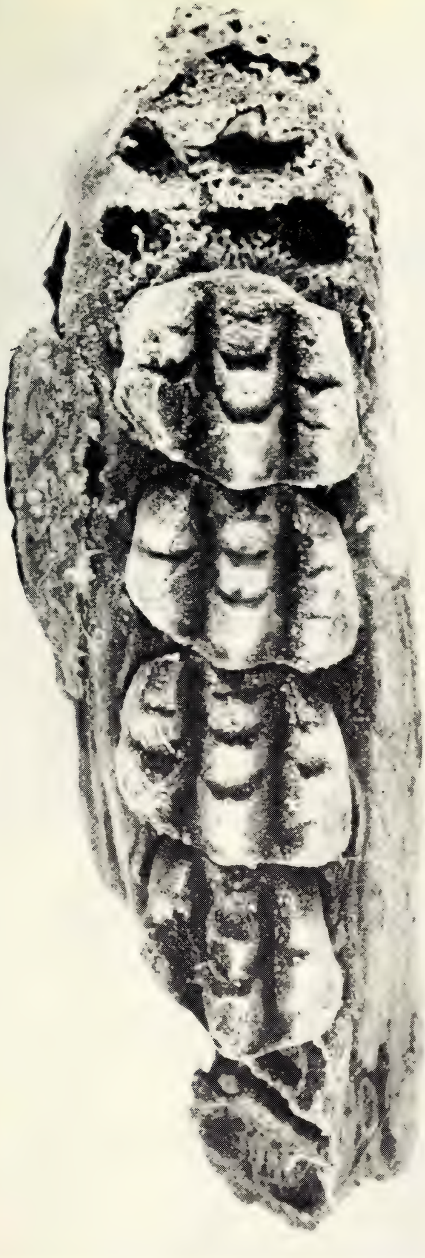
Overlying the limestone in Qs is a conglomerate of varying thickness (8 – 40 ft.) consisting of well-rounded boulders of Carboniferous Limestone of various sizes, in a grey to yellow-green matrix. This conglomerate may be traced from point *a* (see Fig. 1) to point *e*, where it is in contact with the limestone, the angle being about 80°. Between *a* and *b*, the conglomerate is about 25 ft. thick, but at *c* only 6 – 8 ft. with evidence of stratification, tending to follow the bedding plane of the underlying limestone. Between *d* and *e* the conglomerate coarsens considerably.

The conglomerate is not present in the east wall of Qs, but recurs in the north wall between points *f* and *g;* the lowest 12 ft. is of the coarse conglomerate, but overlying this is a band of thinly bedded strata about 3 ft. thick, which consists of gravelly and sandy marls, often with shaly partings and containing quartz grains and many mica flakes in a calcareous matrix. The colour varies from red-brown to green and the band yields some fragments of bone. Above this there is about 8 ft. of conglomerate, much finer than the lowest 12 ft. of the fissure. This is capped by 15 ft. of the typical coarse conglomerate seen in the south wall of Qs, and the bedding plane between these two conglomerates is clearly visible. The west wall of the fissure is inclined at 75° – 80° and shows signs of slight movement, while the east wall is almost vertical. It should be noted that no trace of the thinly bedded layer is found in the southern face of Qs, nor is the bedding plane between the conglomerates visible. When the exposures of conglomerate are extrapolated on to the map, they form a roughly triangular outline, although the extent of the conglomerate to the south is not known.The conglomerate does not appear anywhere in Qn, and it seems reasonable to close the northern angle of the triangle. It is very likely that this desposit was laid down during flash-flooding in a wadi, which would account for the well-rounded boulders, the definite north-south axis, and the lack of sorting. The variation in depth may be due to a variety of factors, but probably results from irregularity in the wadi floor. The thinly-bedded band seems to be confined to the northern end, and must be due to the trapping of a pocket of finer sediment: this is comparable with parts of the fissure at Slickstone Quarry, near Cromhall, Glos. (Robinson 1957).

ANATOMICAL DESCRIPTION

The right maxilla of *Oligokyphus* was found in 1961 in the hard conglomeratic matrix of a fissure in Qn (25 yd. east of 18° dip on map). The matrix was removed with formic acid; the bone and four teeth are stained black. Only that part of the maxilla surrounding the teeth is preserved, with alveoli of first, sixth and seventh maxillary teeth; the second to fifth maxillary teeth are present and display moderate wear. The length of third to fifth teeth inclusive is 12.0 mm., which is close to the type of Kühne's *Oligokyphus major*. The cusp pattern, illustrated in Plate V, follows precisely the detailed description in Kühne (1956). Three rows of cusps are present on each tooth, the fifth (last preserved) tooth has four cusps in the middle row as in Kühne's *O. major* and not three as usually found in *O. minor*. The crowns have a marked transverse asymmetry which confirms that the specimen is a right maxilla. The alveolus of the first tooth contains two transverse rows of roots, anteriorly a circular and L-shaped cavity and posteriorly three cavities, the middle being the smallest. Only the internal wall of the alveoli of the sixth and seventh teeth remains.

The specimen is now in the collections of the Geology Museum, University of Bristol (registered number 19046).



Occlusal aspect of right maxilla of *Oligokyphus major*, U.B. 19046.
Holwell Quarry, Frome. ×6.

facing page 188]

COMPARISONS

(i) **Windsor Hill.** From Windsor Hill quarry near Shepton Mallet, Somerset (ST/615452) Kühne (1956) processed 15 tons of fissure filling to obtain about 2,000 specimens of *Oligokyphus;* this is the only higher vertebrate present in the fauna and from a count of the dentaries, the most plentiful bone, a minimum of 44 individuals is represented. On the basis of dental measurements, Kühne recognised two well defined groups to which he gave the names *O. major* and *O. minor.* The anatomical details of the Holwell *Oligokyphus* are identical to those of specimens of *O. major* from Windsor Hill, the sites being only 7½ miles apart. The lower vertebrates at Windsor Hill include *Acrodus*, *Hybodus* and *Birgeria* teeth as at Holwell. Kühne dates the fissure filling on the presumed contemporaneous invertebrate fauna as Lower Lias. Kühne (1956) and Robinson (1957) regard both the Windsor Hill and Holwell fissures as neptunian dykes, infilled under the sea but close to the land.

(ii) **Württemberg.** The bone beds of Württemberg are known to range from Upper Keuper to Lower Lias and yielded a therapsid fauna in the last century, the detailed localities, and thus precise horizon, of each being unrecorded. The fauna comprises lamellibranchs, fish, amphibia and reptiles. The therapsids present (details in Simpson 1928) are:

Tritylodon fraasi Lydekker	1 upper molar (lost)
Chalepotherium plieningeri (Ameghino)	1 broken molar
Thomasia antiqua (Plieningeri)	1 molar
Oligokyphus triserialis Hennig	1 upper molar
,, *biserialis* Hennig	1 lower molar

Chalepotherium appears to be close to *Tritylodon* and *Thomasia* close to *Haramiya.* Thus the Württemberg fauna contains both *Oligokyphus* and a haramiyid, though it is not known whether both genera occur at the same horizon or in the same locality.

(iii) **Earlier discoveries at Holwell.** At the September meeting of the British Association in 1858 Mr. Charles Moore described how he found teeth of *Acrodus*, *Hybodus* and *Saurichthys* in a slab of rock picked up from a roadside heap of Carboniferous Limestone near Frome, Somerset. He concluded the slab must be of Triassic age, though no such beds outcropped in the vicinity but the nearby quarry in Holwell has fissures with similar remains. Then in a footnote added after the paper had been delivered, he wrote 'three mammalian teeth, identical to *Microlestes antiquus* of the Upper Trias of Wirtemberg, have been found' (Moore 1859). This is the first British record of *Haramiya*. Moore continued diligently to search the fissures of Holwell, removed about three tons of the matrix, washed and sieved it and examined the residue for microfossils. Over the next decade this yielded him about 70,000 *Acrodus* and many other fish teeth, together with 27 of the precious *Haramiya* teeth. The current position on these teeth is as follows:

Haramiya moorei	7 molars	Bath Museum
	1 molar	Peabody Museum, Yale
Haramiya fissurae	3 molars	British Museum (Nat. Hist.)
Thomasia anglica	2 molars	Bath Museum
	1 molar	Peabody Museum, Yale
Haramiya sp.	5 canine / incisors	Bath Museum.

This accounts for 19 of the teeth. In a letter to Professor Marsh, dated 27th Sept. 1881, Moore stated that he had sent 'a little box with nine molar [and] other teeth, seven at least belonging to *Microlestes*.' Of these only two can now be located at Yale, which implies seven missing. One of the teeth in the Moore Collection in Bath (M 215) is, as pointed out by Parrington (1947), certainly a *Sargodon* tooth. Simpson (1928) commented that it did not match Owen's illustration (Owen 1871, Pl. 1, Fig. 1–iv). The tooth was mounted crown down on cardboard and Simpson and Parrington do not appear to have had the opportunity of removing it for closer examination. The disappearance of Moore's original is a mystery. Moore (1865) made the statement that he had 'exhibited twenty-nine teeth of the oldest mammals. Winwood (1892, p. 14), who was curator of the Bath Museum when the Moore Collection was purchased, stated in his biographical account of Charles Moore that he had 'discovered twenty-seven *Microlestes* teeth'. Since the 1865 note to the British Association is the only one to mention 29 teeth and all other papers by Moore and his contemporaries report a maximum of 27 teeth, and in the absence of any other evidence for a higher number, we may surmise a typographical error.

In 1939 Dr. W. G. Kühne worked at Holwell and his washing and sieving of 2¼ tons of matrix yielded him 2 triconodont teeth, 13 *Haramiya* molar teeth and 5 canines or incisors: of the 13 molars, 11 are in the Zoology Museum, Cambridge, 1 in the Geology Museum, University of Bristol, and one deposited in the Bristol City Museum was destroyed during the war.

The site of Moore's finds of *Haramiya* is an east-west fissure on the south side of the road (Qs). All but one of Kühne's teeth came from a similar position and possibly from the same fissure. Moore (1867) noted a four-foot wide fissure in the quarry on the north side of the road, filled with vertical layers of Liassic limestone and with core of sediment yielding Liassic fossils. Kühne's single black *Haramiya* tooth was found in dark grey sediment with pyrites in Qn. This probably came from the same fissure which yielded the *Oligokyphus* described above. Some five years ago, with the encouragement and help of Dr. C. R. Burch of the University of Bristol, 3½ cwt. of the soft fissure infilling in Qn was elutriated and the concentrate sorted on a mechanical separator; the yield was 49 *Birgeria* teeth, 232 *Acrodus* teeth, 227 *Gyrolepis* scales, 18 fish vertebrae and 397 bone fragments, together with brachiopods, belemnites, bradyodont tooth and pyritized rods, spheres, gastropods and lamellibranchs. The concentration was very much less than that recorded by Moore and Kühne and hence the chances of finding further haramiyid teeth was regarded as negligible.

Kühne (1947) detailed the arguments for the ages of the fissure infilling, concluding that the range of time during which the fissures at Holwell were filled probably extended from Upper Rhaetic to Lower Inferior Oolite. The find of *Oligokyphus* does not conflict with this, nor does it help directly to reduce the time span. The relative diversity of the Holwell fauna as compared to those of neighbouring fossiliferous fissures may be a consequence of this longer time interval during which they received material, primary and derived.

SUMMARY

The find of *Oligokyphus* is recorded from a Mesozoic fissure-filling at Holwell Quarry, Frome, Somerset.

ACKNOWLEDGMENTS

The authors are grateful to Messrs. George Coleman & Co. Ltd. for unlimited access to the Holwell Quarries, to Mr. I. H. Ford for discussion and comment, to Mrs. M. Dearden for the drawing and to Mr. R. Godwin for the photograph.

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SOME MOSSES OF THE FROME VALLEY

BY D. MUNRO SMITH

THE river Frome, formerly more important than it is today, flows from Winterbourne Down to the outskirts of Bristol at Stapleton and Eastville through a valley composed of Red Sandstone (Pennant). The acidic soil here contrasts sharply with the calcareous soil of the Avon Gorge and the mosses of these two areas are in many respects distinct, as comparison of the Bryophyte floras of these localities shows (for a list relating to the Somerset side of the Avon Gorge see Willis, these *Proceedings* for 1963).

In the Frome valley occur some mosses which are definitely calcifuge, restricted to acid substrata, but there are also many which are to some extent indifferent, occurring on a range of soils from mildly basic to mildly acidic. A few of the mosses of Glen Frome are calcicolous, at least to a certain extent. Among them are *Anomodon viticulosus*, *Barbula fallax*, *B. recurvirostra*, *B. tophacea*, *Camptothecium sericeum*, *Cratoneuron filicinum*, *Eurhynchium striatum* and *Trichostomum sinuosum*. A number of these occur mostly on walls or weirs (e.g. *Fissidens crassipes*) which doubtless contain some calcareous matter, and others at the edges of paths and in fields where lime may have been added. Also found on dry walls is *Dicranoweisia cirrata*, especially on Bury Hill, Winterbourne, a moss apparently indifferent to soil reaction; it grows on sandstone rocks in the vicinity, as well as epiphytically on trees. Other epiphytes are *Cryphaea heteromalla*, *Tortula laevipila* and, on willow, *Orthotrichum lyellii*, the last recorded by H. H. Knight (The Mosses of Gloucestershire, *Proc. Cotteswold Nat. Field Club*, 1914) as common, but most of his records refer to the Cotswolds. The genera *Ulota* and *Orthotrichum* are not well represented close to Bristol, although *O. diaphanum* seems fairly common, occurring on dead wood, stones and walls. *Aulacomnium androgynum*, usually on rotten wood, grows in one locality on sandstone rocks; also on wood and along paths is *Leptobryum pyriforme*. *Heterocladium heteropterum* is found on siliceous rocks, but has also been recorded as occurring sparingly in the Avon Gorge (Knight, *op. cit.*); further information on this point is desirable. *Eucladium verticillatum*, reported originally as growing on sandstone, is on a calcareous substratum in Glen Frome.

Mosses of the Frome Valley which are calcifuges include:

Bartramia pomiformis
Campylopus flexuosus
Dicranella heteromalla
Ditrichum heteromallum
Isopterygium elegans
Mnium hornum
Pleuridium acuminatum
Pleurozium schreberi
Pohlia nutans
Polytrichum aloides
P. formosum
P. juniperinum
P. nanum
P. piliferum
Rhacomitrium heterostichum
Tetraphis pellucida
Trichostomum tenuirostre

Mosses more or less indifferent to soil reaction are:

Acrocladium cuspidatum
Amblystegium juratzkanum
A. serpens
Atrichum undulatum
Barbula unguiculata
B. vinealis
Brachythecium albicans
B. populeum
B. rutabulum
Bryum caespiticium
B. capillare
B. rubens
Dicranella schreberana
Dicranum scoparium
Eurhynchium confertum
E. praelongum
Fissidens adianthoides
F. bryoides
F. taxifolius
Funaria fascicularis
Grimmia pulvinata
Hypnum cupressiforme
H. cupressiforme var. resupinatum
Isothecium myosuroides
Mnium affine
M. longirostrum
M. punctatum
M. stellare
Omalia trichomanoides
Plagiothecium denticulatum
P. sylvaticum
Pottia bryoides
P. intermedia
P. truncata
Pseudephemerum nitidum
Rhynchostegiella pumila
Rhytidiadelphus squarrosus
Thamnium alopecurum
Thuidium tamariscinum
Tortula muralis
T. subulata
Weissia controversa

Mosses in running water or subjected to periodic inundation include:

Brachythecium rivulare
Cinclidotus fontinaloides
C. mucronatus
Eurhynchium riparioides
Fontinalis antipyretica
Leptodictyum riparium
Leskea polycarpa
Tortula latifolia

The lists are not exhaustive, but simply give results of observations made in the valley over several years. Referees of the British Bryological Society have in many cases determined and confirmed specimens, and special thanks are due to Mrs. J. Appleyard for assistance.

THE GEOLOGY OF THE KEYNSHAM BYPASS

By A. B. Hawkins

I. INTRODUCTION

THE building of a road to bypass Keynsham has been under discussion since at least 1910, although it was not until 1964 that a start was made on the construction. This paper records the geology exposed along the route of the bypass which extends from Hick's Gate in the west to Broadmead Lane in the east (Fig. 1A).

The stratigraphy of the area is shown in the section (Fig. 1B). The western end of the road is cut through the Pennant Series of the Coal Measures, which here is unconformably overlain by Keuper Marl. The Pennant ends abruptly near Durley Lane due to the Durley Hill Fault, which has a downthrow of about 80 ft. to the east. Across Keynsham Hams the solid geology is concealed by about 29 ft. of alluvial deposits. Then eastwards follows an excellent exposure of the Blue Lias. The Lias section is divided by the valley of the River Chew, to the east of which the upper part of the Blue Lias and the clays of the Lower Lias are exposed until the end of the bypass.

II. THE PENNANT SERIES

The Pennant rocks are visible between Hick's Gate roundabout and Durley Lane. In the east of this exposure the excavations form an almost strike section, showing a dip of about 18° S.W. The total visible thickness of the Pennant is about 360 ft., a maximum of 24 ft. being exposed at any one point. The Pennant is dominantly arenaceous but shale horizons are seen at the bottom and top of the visible section.

The lowest beds exposed are near the railway bridge over Durley Lane, where there are old workings marked on the Ordnance Map. The workings are associated with the mining of the Salridge Thin Coal Seam which took place many years ago; the fauna of this horizon is recorded by Moore and Trueman (1937). Above this seam is a band of shaly material. These bluish-black shales exist on both sides of the excavation although, because of the strike direction, only six feet is exposed on the south side.

Above this shale horizon is a considerable thickness of sandstone with subsidiary shaly bands. The sandstones are of two main types.

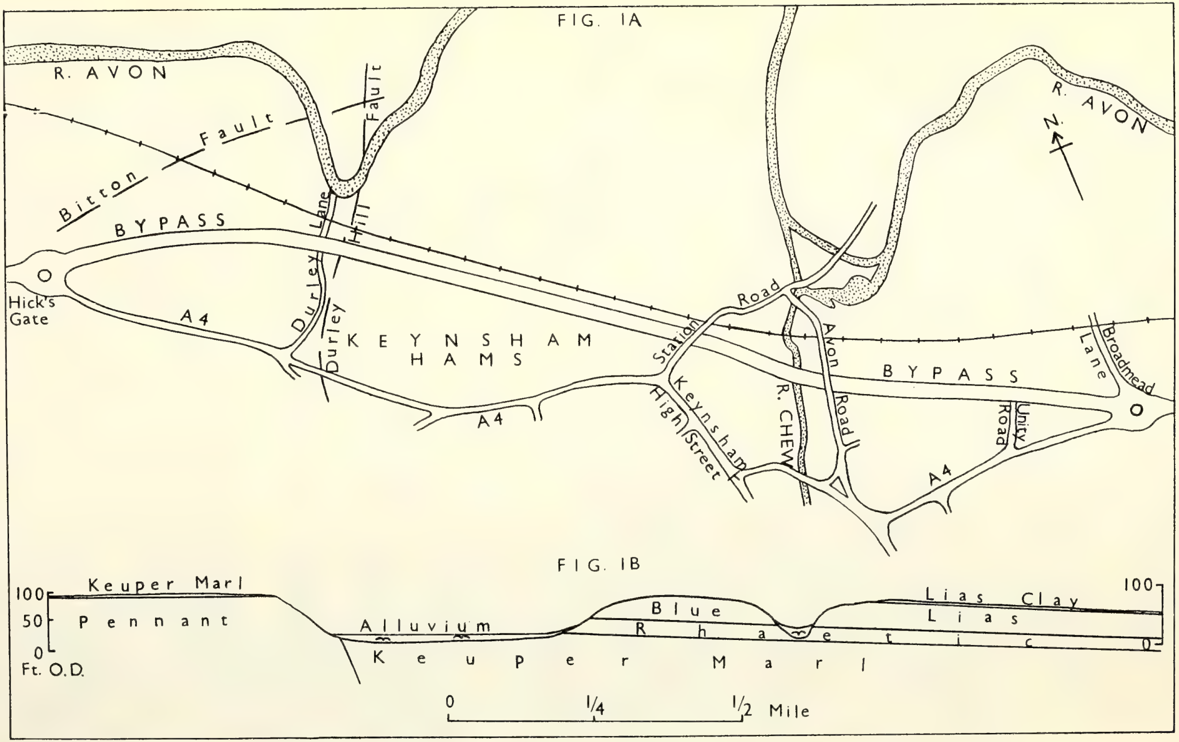
FIG. 1A
R. AVON
Bitton Fault
Fault
BYPASS
Lane
Hill
Durley
Durley
Hick's Gate
A4
KEYNSHAM HAMS
A4
Station Road
High Street
Keynsham
R. CHEW
Avon Road
R. AVON
N.
BYPASS
Broadmead Lane
Unity Road
A4
FIG. 1B
100
50
0
Ft. O.D.
Keuper Marl
Pennant
Alluvium
Keuper Marl
Blue
Rhaetic
Lias Clay
Lias
100
0
0
1/4
1/2 Mile

FIG. 1A. *The route of the Keynsham bypass.*

1B. *Geological section along the bypass route.*

One, rather massive and greenish-grey, sometimes forms bands up to 18 inches thick which show no current bedding. The other, by far the most common, is made up of a series of current-bedded sandstones with beds of ½—4 inches. The general dip of the current bedding is about 25—40° S.W. Carbonaceous material is scattered throughout the arenaceous deposits and even found within the massive sandstones in the form of small pellets. Sometimes where carbonaceous material existed in the sandstones it has been washed out leaving the rock with a maze of hollows. One of the lower carbonaceous bands which is 5 inches thick is split in the west by a tongue of arenaceous material, probably a rolled slump deposit.

Where the Pennant is overlain by the Keuper Marl, ferruginous deposits exist along the stratification planes, and in the joints. There is a main trend of joint direction, N.–S., but a subsidiary trend E.–W. A sample of the deposit from the thickest vein was examined by I. H. Ford who identified the dark mineral as goethite and the light or white one as barite. In this particular joint goethite—a hydrous iron oxide—forms an almost massive vein 5 inches thick. Its position is significant as it lies just above the lower shale horizon which may have formed a barrier to percolating ferruginous solutions. Towards the middle of the vein is a band of barite with fine acicular crystals showing an unusual radiating habit. In many of the other veins the ferruginous deposit is massive; however in some of the smaller veins it is fibrous and many of the intermediate sized ones exhibit botryoidal surfaces wherever the iron formed freely in the void of a joint.

This sandstone horizon also showed several slight flexures and faults. One such fault, with a downthrow of 18 inches to the W.N.W., had a hade of 12° and showed by the slickensiding that there has been movement both vertically and horizontally.

At the western end of the section is exposed about 40 ft. of the higher shale horizon. Again the colour is bluish-black and some of the surfaces have ferruginous staining.

The upper surface of the Pennant Series is clearly a pre-Triassic plane of erosion, transgressing both sandstone and shale alike. This erosion surface is within 2° of the horizontal and as the Pennant has a dip of 18° it proves that the Pennant assumed this dip as a result of Armorican folding. Further, the fact that the fault already referred to does not affect the Keuper Marl or displace the erosion surface indicates that the faulting was also Armorican in age. Although most major faults in the area, e.g. the Bitton and Durley Hill Faults, are post-Jurassic, there is no evidence that this latter tectonic period caused any important structural features in the Pennant, unless it was to increase the jointing.

III. THE KEUPER MARL

Above the erosion surface at the top of the Pennant lies up to 8 ft. of red Keuper Marl. This agrees with the Geological Survey mapping except that the boundary shown (marked 'indefinite') is slightly too restrictive. The new field evidence indicates that the boundary has a similar shape to that given by the Survey, but its position is about 400 ft. north of the suggested line.

IV. THE LIAS

A. Section west of the River Chew

Although the *johnstoni* and *laqueus* subzones are nowhere exposed by the excavations, their presence is suggested by a borehole at Station Road which showed 13 ft. of dominantly shale deposit below the level of road excavations. Further, there is a west-facing feature overlooking Keynsham Hams below the exposed *Angulata* Zone. This feature indicates the probable outcrop of the shales (Saltford Shales) which is confirmed by Tutcher (1923) who records the *laqueus* subzone in the railway section at the Keynsham Hams end.

The *Angulata* Zone has been extensively exposed and shows a slight dip to the east, about 2°. As can be seen in Fig. 2, the general lithology is interbedded limestones and shales, but the limestone bands are sometimes non-persistent and in the lower part nodular, e.g. Bands 3 and 5. Donovan (1956) divided the zone lithologically by the thickest band of shale (Band 13) which in this exposure is 11 inches thick. In the lower section the limestones are frequently very argillaceous. The whole zone yielded fossils, particularly *Calcirhynchia calcaria*, *Pleuromya galathea* and *Gryphea obliquata*, but the ammonites were found only in the lower section of the zone. Donovan (1956) suggests that *Schlotheimia similis* is typical of the lower part of the zone, and this ammonite was recorded here from Bands 4 and 5 as well as *S. lymense* from Band 3. Besides crinoid stems, a species of *Cidaris* was found in Band 1, but Donovan (1965), unlike Vaughan and Tutcher (1903), points out that this fossil does extend into the *Angulata* Zone and thus Band 1 is considered part of this horizon.

The *conybeari* subzone is dominated by the thick persistent *calcaria* bed (Band 30). This massive limestone, here 16 inches thick, frequently shows hollows about 5 inches above the base of the bed. Sometimes these cavities in the limestone are infilled with a red-stained argillaceous deposit, while in others they are partially infilled with calcite exhibiting dog-tooth habit. It is suggested that during the deposition of this limestone band there was a small influx

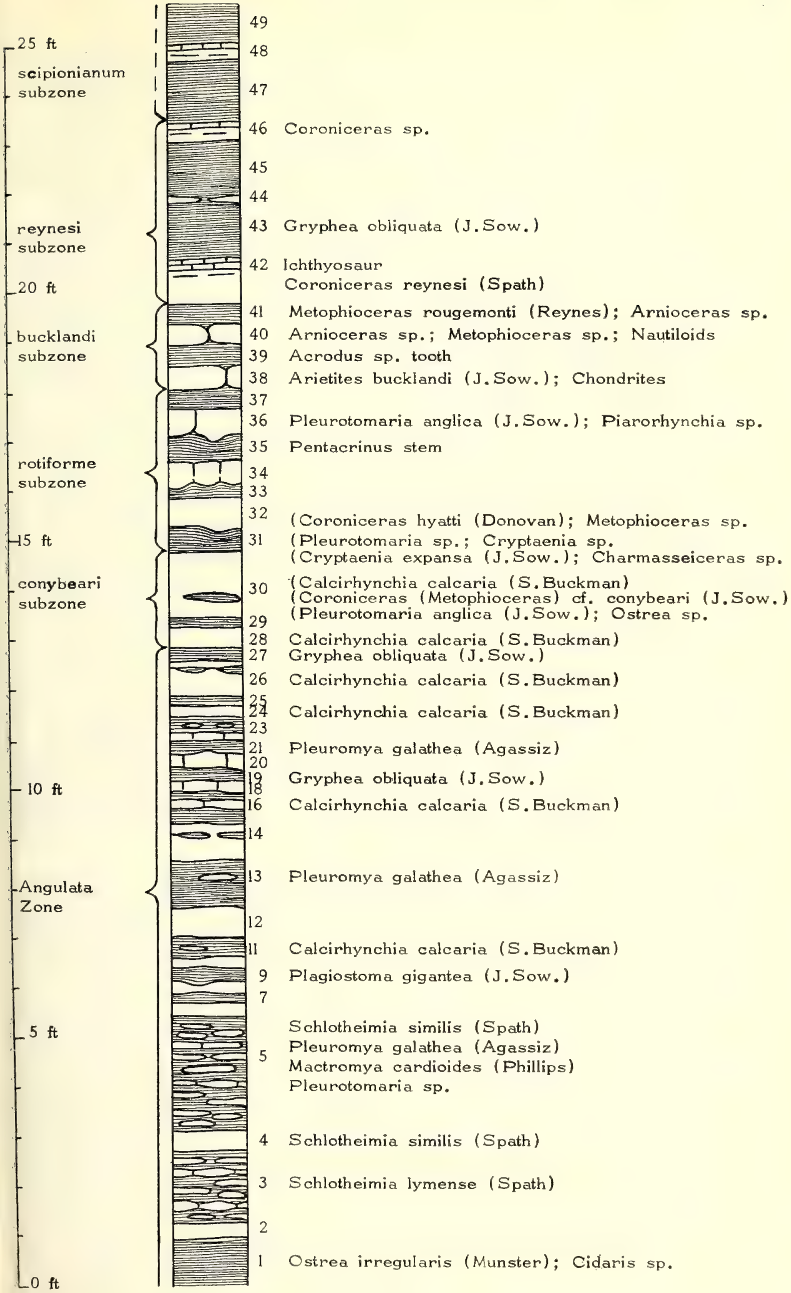
25 ft
scipionianum subzone
reynesi subzone
20 ft
bucklandi subzone
rotiforme subzone
15 ft
conybeari subzone
10 ft
Angulata Zone
5 ft
0 ft
49
48
47
46 Coroniceras sp.
45
44
43 Gryphea obliquata (J.Sow.)
42 Ichthyosaur
Coroniceras reynesi (Spath)
41 Metophioceras rougemonti (Reynes); Arnioceras sp.
40 Arnioceras sp.; Metophioceras sp.; Nautiloids
39 Acrodus sp. tooth
38 Arietites bucklandi (J.Sow.); Chondrites
37
36 Pleurotomaria anglica (J.Sow.); Piarorhynchia sp.
35 Pentacrinus stem
34
33
32 (Coroniceras hyatti (Donovan); Metophioceras sp.
31 (Pleurotomaria sp.; Cryptaenia sp.
(Cryptaenia expansa (J.Sow.); Charmasseiceras sp.
30 (Calcirhynchia calcaria (S.Buckman)
(Coroniceras (Metophioceras) cf. conybeari (J.Sow.)
29 (Pleurotomaria anglica (J.Sow.); Ostrea sp.
28 Calcirhynchia calcaria (S.Buckman)
27 Gryphea obliquata (J.Sow.)
26 Calcirhynchia calcaria (S.Buckman)
25
24 Calcirhynchia calcaria (S.Buckman)
23
21 Pleuromya galathea (Agassiz)
20
19
18 Gryphea obliquata (J.Sow.)
16 Calcirhynchia calcaria (S.Buckman)
14
13 Pleuromya galathea (Agassiz)
12
11 Calcirhynchia calcaria (S.Buckman)
9 Plagiostoma gigantea (J.Sow.)
7
Schlotheimia similis (Spath)
5 Pleuromya galathea (Agassiz)
Mactromya cardioides (Phillips)
Pleurotomaria sp.
4 Schlotheimia similis (Spath)
3 Schlotheimia lymense (Spath)
2
1 Ostrea irregularis (Munster); Cidaris sp.

FIG. 2. *Generalised section of the Blue Lias exposed in the Keynsham bypass.*

of argillaceous material which on compaction segregated into small lenses. Later, where these were cut by joints, the original argillaceous material was washed out and subsequently the hollows infilled by calcite from percolating waters. This band yielded abundant *Calcirhynchia calcaria* (*calcaria* band) as well as *Coroniceras conybeari*, *Charmasseiceras* sp., *Pleurotomaria anglica* and *Pentacrinus* stems.

If the top of the *calcaria* bed is regarded as the top of the *conybeari* subzone—the view held by Donovan (1956)—the *rotiforme* subzone then begins with Band 31, 6—8 inches of shale. As the first *Arietites* was found in Band 38 it is suggested that Bands 31 to 37 belong to this subzone (cf. Donovan 1956). The lithology is characteristically interbedded limestones and shales, as seen from the profile (Fig. 2). One of the features of the limestones is their irregularity, especially of the basal surface. In band 36 the amplitude of the under surface relief reached 4½ inches.

The fauna of the *rotiforme* subzone is found almost exclusively in Band 31, which contains many ammonites generally about 2 to 3 inches above the base of the band. The presence of abundant *Coroniceras hyatti* at one level suggests a condensed faunal sequence. However, apart from *Metophioceras* sp. and an abundance of other phyla at the top of the *calcaria* bed there is no proof here of the existence of the remanié bed, although Donovan (1956), using faunal evidence given by Tutcher (1923), has suggested its presence in the railway cutting. The ammonites found in the limestones of this subzone are not normally mature, suggestive possibly of very disturbed conditions, probably due to wave action during *rotiforme* subzone times. Bone fragments from the base of Band 32 add further evidence of shallow water.

The *bucklandi* subzone begins with Band 38 and it is suggested that Bands 38 to 41 are included within the subzone. As well as the subzonal fossil *Arietites bucklandi*, *Metophioceras rougemonti*, *Arnioceras*, bone fragments and the tooth of *Acrodus* sp. have been found.

The *reynesi* subzone is recorded by Donovan (1956) as being 3 ft. thick at Keeling's Quarry (ST/659681) and therefore it is suggested that Bands 42 to 46 belong to this subzone. The limestones, which in this subzone become subordinate to the shales, lose their massive character and become more fissile. This is seen in Band 42 where the upper part is more stratified and in Band 44 which consists of thin lenses of fissile limestone. *Arnioceras* has been found, but perhaps the most notable fossil was an Ichthyosaur at the top of Band 42. Bone fragments are not infrequent in this horizon and Wright (1878, p. 36) records an Ichthyosaur from the same band in the Saltford Railway Cutting.

Although no fossils have been found to confirm it, the *scipionianum* subzone is probably represented by Bands 47 to 49, as Donovan records that the lower part of the subzone is chiefly argillaceous in lithology.

B. Section east of the River Chew

The Lias east of the River Chew was never so prominently exposed as the main section just described. Satisfactory ammonites are few and only *Coroniceras* sp. has been found definitely *in situ*. For this reason no satisfactory palaeontological correlation is possible. Lithologically and structurally however, there is no evidence to suggest that the beds do not correspond to those west of the river. The presence of the Blue Lias limestones can be seen in the field and their effect on the shape of the Chew Valley, causing it to be steep and narrow, continues southwards to Chewton Place.

East of Avon Road, the bypass descends down the dipslope of the Lias with little excavation necessary. Where excavation has been undertaken it has exposed the typical Lower Lias clays with occasional limestone fragments. This was confirmed by a borehole where the bypass crosses Unity Road.

3.	Top soil etc.	0 ft.	6 in.
2.	Firm to stiff greenish-fawn poorly laminated silty clay	8	0
1.	Stiff blue-grey shaly clay with layers of hard grey sandy limestone	7	6

It is possible that the lowest band (1 above) is part of the *sauzeanum* subzone as it has similar lithology to that recorded from Keeling's Quarry (Donovan 1956) and would be at about the correct stratigraphical height.

C. Structure

In the Lias one small anticline was seen 70 yards west of Station Road. With a strike E.N.E.—W.S.W. it has an amplitude of only 2 ft., although it is probably the one shown in the photograph in the paper by Tutcher (1923) in connection with the description of the section near the Water Tower (ST/657692). No evidence of any faulting was seen in the Lias section, despite the two faults suggested by Tutcher when describing the geology of the area of Fry's Factory. It is possible, however, that some of the larger joints trending N.N.W., and which often transgress ten or more bands, may have resulted from tectonic stress.

V. THE ALLUVIAL DEPOSITS

There was very little excavation in the alluvial deposits during the building of the bypass. Despite a few extra boreholes no information has been added to that recorded by Donovan (1960) who notes that in the Keynsham Hams area there is about 4 to 10 ft. of brown silty clay overlying gravel, the base of which is not reached. The position of the alluvial deposits and the relief of the Keynsham Hams indicate however that in the past the River Avon existed half a mile south of its present position and flowed in fact near the route of the A4. During this time the river would have eroded on its concave bank and in this way caused the recession of the Pennant outcrop to its present position 200 ft. west of the fault as shown on the Geological Survey map.

VI. ACKNOWLEDGMENTS

The writer thanks the many who have helped with this work: the engineers of the Somerset County Council and Farrs for permission to examine the section and their records freely; Mr. I. H. Ford for many discussions and encouragement and the examination of the ferruginous specimens; Mr. T. R. Fry for his great help with fossil identification and Prof. D. T. Donovan for helpful criticism of the script.

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THE AVON GORGE

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INTRODUCTION

EIGHTY years ago in a Presidential Address to the Geological Section of this Society, Lloyd Morgan (1885) discussed the problem of 'Sub-aerial denudation and the Avon Gorge.' It is the purpose of the present paper* not only to bring his review up to date but also to reconsider the earlier work and to set it against the history of the study of landforms. Recent correspondence on the subject in the local press suggests that this further account is opportune.

Deep valleys on the earth's surface have been variously ascribed to the action of supernatural agencies, the Deluge, natural catastrophes, marine and sub-aerial denudation. These explanations have at some time or other been applied to the gorge of the Avon at Clifton (Plate VI).

Since it is now generally recognized that the valley has been carved by the river itself it is necessary to consider first the Avon drainage system as a whole, including the general geology of the basin, and thus to set the development of the gorge at Clifton in a wider evolutionary scheme.

Several rivers of eastern England have their source on the Cotswold dip-slope and flow in a south-easterly direction, but only the Bristol Avon breaks through the escarpment and flows westwards into the Severn system. It rises in the vicinity of Badminton and flows obliquely down the dip-slope of the Great Oolite as far as Malmesbury where it turns southwards along the Oxford Clay vale to Bradford-on-Avon and then runs contrary to the dip in a gorge through the Cotswolds to Bath. Thence it flows through the Keynsham basin, the Hanham Gorge, the Bristol basin, the Clifton Gorge and the Severn flats before reaching the Severn at Avonmouth. There are, as Crookall *et al.* (1930) have stated, several puzzling features about this course: the breaching of the Cotswolds, the apparent disregard of the hill ranges in its path and the failure to flow out through the low gap at Flax Bourton. Several other streams in the district, the Trym, the Gloucestershire Frome, and the Little Avon share this characteristic of disregard of present structure.

A study of the geological map of the Bristol district (Fig. 1) and of the section (Fig. 2) shows that, while the younger, Mesozoic, rocks have a gentle and more or less even dip east, the Palaeozoic rocks across which the river flows have a complex structure. Since their complexities bear on the development of the river system, a brief review of the geological history of the region is given.

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*Substance of an address to the Geological Section, January 1965.

The Lower Palaeozoic rocks are poorly represented but a thick series of sediments was laid down in Upper Palaeozoic times. These comprise perhaps 3–4,000 feet of Old Red Sandstone, 3,000 feet of Carboniferous Limestone and Millstone Grit, and 8,000 feet of Coal Measures (including the Pennant Sandstone). This great thickness of strata was folded on both east-west and north-south axes during

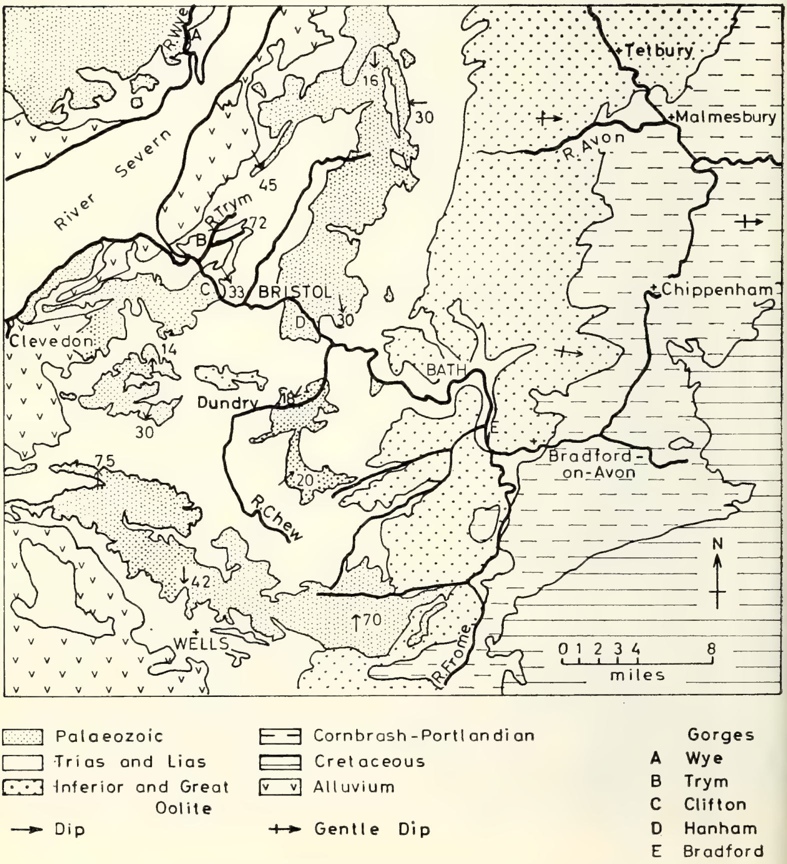
R. Wye
A
Tetbury
Malmesbury
16
30
R. Avon
River Severn
45
R. Trym
72
B
C
33
BRISTOL
D
30
Chippenham
Clevedon
14
BATH
Dundry
18
30
E
Bradford-on-Avon
75
20
R. Chew
N
42
70
WELLS
R. Frome
0 1 2 3 4 8
miles
Palaeozoic
Trias and Lias
Inferior and Great Oolite
Dip
Cornbrash-Portlandian
Cretaceous
Alluvium
Gentle Dip
Gorges
A Wye
B Trym
C Clifton
D Hanham
E Bradford

Fig. 1. *Simplified geological map of the Avon Basin.*

and at the end of Carboniferous times and the mountains produced suffered intense erosion during the late Carboniferous, Permian and early Triassic periods when in places perhaps 12-14,000 feet of strata were removed.

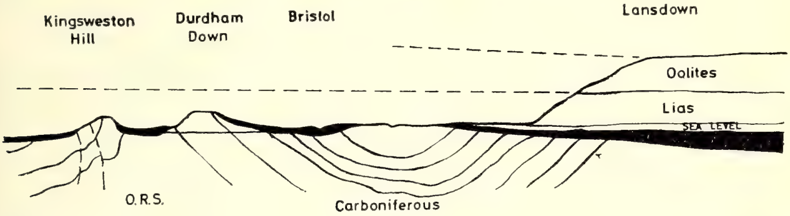

FIG. 2. *Diagrammatic section from Avonmouth to Bath.* The Trias is shown in black. Former extensions of the Lias and Oolites are given by pecked lines.

The remnants of these Armorican mountains began to be covered in late Triassic times and in many places in the Bristol Channel area, coarse screes, preserved as the Dolomitic Conglomerate, can be seen resting against the Carboniferous and Old Red Sandstone rocks giving the impression of a series of 'islands.' This Triassic continent was then flooded by the Rhaetic seas and in the early Jurassic the islands became progressively inundated until the Mendip area was covered over, perhaps in Liassic times and certainly by Inferior Oolite times. Throughout most of the Mesozoic this marine transgression continued until, in the Cretaceous, not only all the Bristol district but probably the whole of Wales too was covered by a sea in which the Chalk was being deposited. The result of this inundation was to fill in the irregularities in the Armorican mountain ranges and when, at the end of the Cretaceous, the sea retreated, it left the original rough landscape heavily blanketed by younger rocks.

The Bristol Channel region has remained above sea level for much of the time since the end of the Cretaceous but there have been several marine incursions which are discussed later.

CATASTROPHIC AND OTHER PROCESSES

One of the earliest attempts to explain the origin of the gorge at Clifton is to be found in the local legend of the giants Vincent and Goram (Warne 1948). These two brothers wanted to leave some permanent memorial of themselves to the local inhabitants so decided to divert the course of the Avon by each digging a ravine, Vincent at Clifton and Goram at Henbury. The project ended in catastrophe for Goram was killed by a pick thrown by his brother and Vincent fell into his own ravine when stepping back to admire his handiwork.

This appeal to the supernatural is to be found in the earliest writings of the Greeks, but soon more natural explanations were put forward and the ability of rivers to carve out their valleys was recognized. At the same time however there were those who believed that deep valleys were produced by sudden and violent catastrophes and these two sets of views—the fluvial and the catastrophic—continued to be set forth simultaneously up to the nineteenth century.

In 1833 de la Beche discussed the gorges of the Meuse and Avon and felt that rivers would have had to flow uphill if they were to cut the gorges. 'Gorges or ravines would seem due to the cutting power of running waters or to rifts in the rocks produced by violent convulsions!'

In the course of Buckland's first Presidential Address to the Somerset Archaeological and Natural History Society (1849) he ascribed the formation of the Mendips to the uplifting and explosive force of vapours generated in the earth by subterranean fires. 'Fractures and dislocations which attended the elevation of these strata from the bottom of the sea may be seen in the rocks at Cheddar . . . and in the gorge through which the Avon passes at Clifton.'

In 1865 Murchison strongly denied that valleys and gorges in fairly flat country could be cut by rivers. He believed that the valley at Bath was produced by a convulsion and that the hot waters there came from a deep-seated fissure along which there had been movement. The lazy-flowing, mud-collecting Avon could not have scooped out the channel at Bath while at Clifton the river had only accumulated mud and had never worn away any portion of the hard rock. 'We are also compelled to admit that the convulsive dislocations of former periods produced many of those gorges in which our present streams flow.'

In a discussion of the gorge in 1870, Ravis stated that the chasm was probably initiated by a violent rupture of the rocks but was then widened by marine agencies, while Stoddart (1870) suggested that it was due to 'the great volcanic outburst at the close of the Triassic period or the commencement of the Liassic ' this being the last natural convulsion that the region suffered. It should be noted that no such volcanic outburst took place in Britain at this period.

As late as 1902 the author of a general textbook, Avebury, found it necessary to contradict the popular idea that Cheddar had been formed by violent disruptions and to state that both it and the Avon Gorge were water worn. In this he was only following the example of Ramsay (1878) who wrote 'The vulgar notion respecting the Avon and its gorge is that before that ravine was formed all the low ground through which the river and it tributaries flow was a large lake, that "a convulsion of nature" suddenly rent the rocks asunder and formed the gorge through which the river afterwards flowed, and so drained the hypothetical lake.'

In the second century A.D. Noah's Deluge was established as a fundamental geological agent as gradually the Genesis account of Creation and subsequent happenings was accepted as scientific fact. The Diluvialists, as they were later called, assembled a vast body of data testifying to the efficacy of the Deluge, and deep valleys often without streams flowing in them were held to be due to this cause. Sutcliffe (1822), after discussing and rejecting catastrophist explanations, invoked equinoctial tides during the latter part of the Flood which forced powerful currents through the rocks of the Avon Gorge leaving steep precipices and 'desolating rocks formed early in the Deluge.'

In North Yorkshire Kendall (1902) and others recognized the existence of old glacial lakes and related to them a series of deep gorge-like valleys which seemed to bear no relation to the general drainage pattern. These valleys were held to be meltwater channels cut by water escaping from one ice-dammed lake to the next either between the icefront and the spur or over a col from one valley to the next. To Harmer (1907) this 'suggested a new method of physiographical research' and in central England he sought for possible lake basins and their meltwater channels. He located one in the Bristol district and called it Lake Trowbridge (Fig. 3), a body of water perhaps 30 miles long and 5–12 miles broad dammed by sedentary ice in the Frome Gap and perhaps also to the north near Swindon. Gradually the lake filled up with meltwater from the ice-covered hills and eventually it overflowed at the lowest point in the encircling hill barrier, at Bradford-on-Avon, and the escaping water cut a deep gorge there and filled up the Keynsham and Bristol basins. The latter was plugged with floe-ice at Flax Bourton so that the Bristol basin filled up and eventually the water found its way over Clifton Down thus cutting another deep meltwater channel and releasing the water to the Severn Estuary. He thought it likely that the Henbury Gorge is also a glacial overflow channel. So far no strand lines associated with Lake Trowbridge have been found, nor are there the vast spreads of gravel near Bath and Sea Mills which one would expect. Recently, however, Mitchell (1960) has resuscitated an idea of Maw (1864) that there was a glacial lake over the Bristol Channel, dammed up by the Irish Sea and Welsh ice to the west and Leese and Vernon (1961) have discovered gravels at the

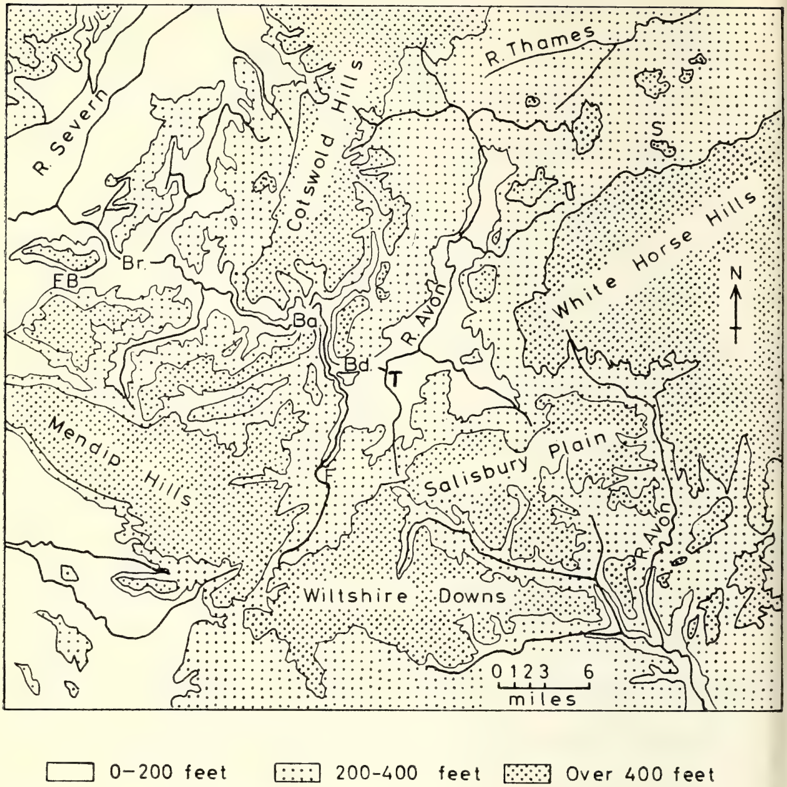
R. Severn
R. Thames
Cotswold Hills
S
White Horse Hills
N
Br.
FB
Ba
R. Avon
Bd.
T
Mendip Hills
F
Salisbury Plain
R. Avon
Wiltshire Downs
0 1 2 3 6
miles
0–200 feet
200-400 feet
Over 400 feet

FIG. 3. *The site of glacial Lake Trowbridge.* Br – Bristol, FB – Flax Bourton, Ba – Bath, Bd – Bradford, F – Frome, T – Trowbridge, S – Swindon.

I.C.I. site on Severnside which they consider might be delta deposits of the Wye in such a lake.

The lack of features referred to above and the fact that several other streams in the vicinity behave very much the same as the Avon, and flow nearly parallel to it, suggest that a more regional explanation of the gorges is necessary.

FLUVIATILE EROSION AND THE MESOZOIC SURFACE

During the nineteenth century there was a long and often bitter debate about the relative merits of the erosive power of the sea and rivers. Some geologists like Lyell and Mackintosh believed in marine erosion; others, like Greenwood, were fluvialists, while others supported Ramsay in his theory of marine planation (see for example Chorley *et al.* 1964, pp. 301–418).

The topography of the Cotswold area was discussed from the standpoint of marine erosion by Hull (1855), Ravis (1868) and Lucy (1869) among others, but only Mackintosh (1869) mentioned the Avon Gorge specifically. He stated that the Bradford Gorge shows traces of the action of the sea and can easily be explained by the excavating power of marine currents and echoes Murchison in querying the power of the lazy-flowing and mud-collecting Avon. Cheddar and other gorges in Mendip were also said to be marine straits.

Jukes was one of the leaders of the fluvialist revival in Britain and in 1867 wrote an account to show 'that the hypothesis of atmospheric erosion is applicable to the Clifton Gorge as to all similar places.' He suggested that if an observer were to stand on Clifton Down and look towards Dundry (Fig. 1) he would see that the Oolites of Dundry, if extrapolated, would pass between 200 and 300 feet over his head and that the Lias would be underneath and resting on the Carboniferous Limestone surface. The Avon at one time flowed over, and cut valleys into, this surface formed by the Oolites which had been tilted to the west towards the Severn and not to the east towards the Thames. In time this down-cutting breached the Mesozoic cover, the river continued to cut into the Palaeozoic rocks irrespective of their structure and maintained its original course (Fig. 4). This is a clear statement of the principle of superposition which had already been enunciated by Maw (1866) who made no direct reference to the gorge but did mention the Bristol district.

As noted previously there were other views on the origin of the gorge after this work of Jukes but from 1867 onwards it was gradually established that the drainage of the lower Bristol Avon was certainly superimposed; important questions such as the nature and orientation of the new surface and the date of the superimposition still remained however.

Lloyd Morgan (1885) gave strong support to the sub-aerial superimposition hypothesis. He developed the thesis that there are two sorts of denudation, the special with an action localized like that of a file, e.g. by rivers and glaciers, and the general acting like a piece of sandpaper, e.g. normal weathering such as freeze-thaw. The volume of general weathering is, he said, more impressive than that of special denudation. Perhaps his most important conclusion was that the present-day denudation process has 'revealed to us the effects of pre-Mesozoic denudation equally vast'. In other words the present topography of high limestone and sandstone ridges with soft rocks banked up against them is an exhumed landscape which had been buried by the sediments deposited during the Mesozoic.

The theme of superimposition on a Cretaceous surface had already been taken up by Ramsay (1878) and he too followed Jukes in suggesting that post-Miocene movements had tilted the Mesozoic cover at low angles to the north-west. The rivers thus flowed westwards on this surface, the Severn taking a south-westerly course between the hills of Wales and Hereford and the slope of the Chalk and beginning to carve out the Chalk escarpment. After the Severn was well established, however, further earth movements tilted the Chalk to the east and the easterly flowing streams collected to form the Thames.

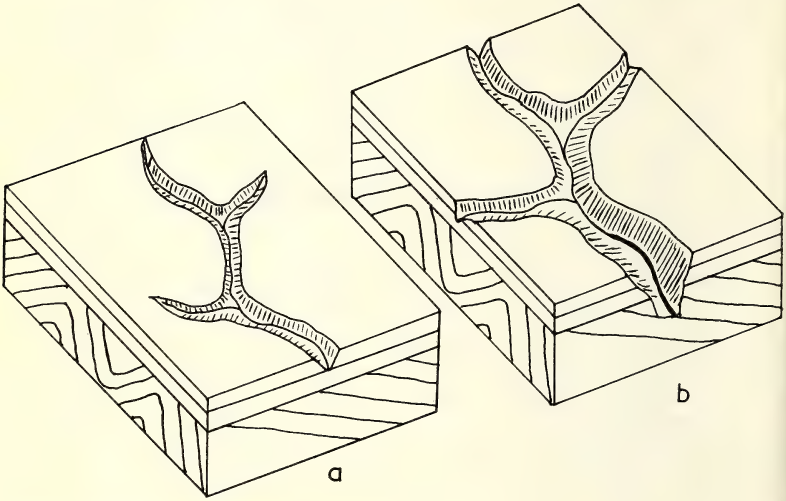

FIG. 4. *Superimposed drainage.*

(a) A river system initiated on a surface of Mesozoic rocks which rest unconformably on folded Upper Palaeozoic strata.

(b) At a later stage the rivers are flowing over the older rocks while still maintaining the directions developed on the newer surface.

Most people considered, however, that the Chalk surface was tilted to the east by movements along a north-east/south-west axis perhaps in the Miocene, a fact suggested by the general strike of the Mesozoic rocks of central England, their dip to the east and the presence of similar rocks in the Irish Sea basin on the north-western side of the anticline. It was on this surface domed up about a point somewhere in Snowdonia that a south-easterly trending drainage system was established (Davis 1895; Buckman 1900; Strahan 1902).

In Buckman's reconstruction (Fig. 5) of the drainage lines, the

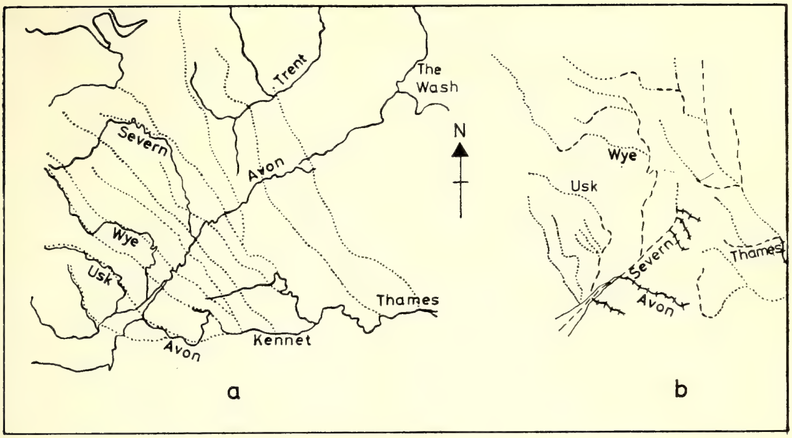

FIG. 5. *Drainage development according to Buckman.*

(a) Original consequent streams shown by dotted lines with present day rivers included for reference.

(b) A later stage than (a) with the consequents beheaded by subsequent streams shown by pecked lines. Other streams are obsequents.

headwaters of the south-easterly flowing consequents were beheaded by subsequent strike streams cutting back towards the north-east along the less resistant rocks such as the clays of the Jurassic, and perhaps the red marls of the Trias, laid bare by the removal of the Chalk above. This capture led to a reversal of drainage of those streams which were originally to the south-east of the Severn so that the Avon, for example, which at first flowed south-easterly as a consequent now flowed towards the north-west, i.e. towards the Severn, as an obsequent stream.

This reversal was supported by Sanders (1918). She noted that the north-south gorges of the Wye, Trym and Avon are fairly well in line and postulated that they were cut in the Oligocene by a river flowing from Wales over the Mesozoic surface, supporting evidence for this being the deposit of gravels containing Welsh pebbles at a height of about 600 feet at Freshford, south-east of Bath. To reinforce her arguments about a south-easterly flow she pointed to the fact that the meanders of the Avon become bigger eastwards (meanders usually increase in size downstream) and to the angle of junction of the tributary rivers. Again the headwaters of this river were captured by the Severn as it cut back north-eastwards so that an obsequent stream flowed through the gorge of the Trym towards the north and finally this was in turn captured by an obsequent from the Severn cutting back along an old pre-Triassic valley previously filled in by soft marls (Fig. 6). In other words the Clifton Gorge was initiated by rivers flowing towards the south-east and the part upstream from Clifton was formed before the hills were etched out, the downstream part being formed later.

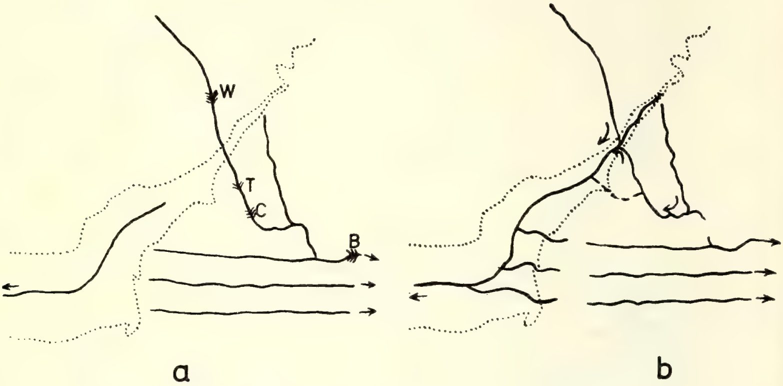

Fig. 6. *Sanders' reconstruction of the drainage pattern.*

(a) The early stage with the present day Bristol Channel shown dotted. Gorges: W – Wye, T – Trym, C – Clifton, B – Bradford.

(b) A later stage showing capture by the subsequent river Severn and later by a smaller obsequent (pecked line).

Varney (1921) also used the presence of gravels containing Welsh pebbles at a height of 5–600 ft. on Farleigh and Bathampton Downs in his reconstruction of the 'Old Southampton River' (Fig. 7). Capture of the south-easterly flowing consequent rivers by the vigorous, subsequent Severn caused an obsequent to flow north-westwards still on a Mesozoic surface but as it cut down to keep pace with the Severn it eventually reached the Palaeozoic rocks and became superimposed on them. The gorge at its present level was therefore eroded by a westerly-flowing obsequent which, as it cut further back, pushed out post-obsequents along the clay vale towards Chippenham and Malmesbury and beheaded the head-waters of the Kennet and Upper Thames. If the gravels are pre–Pleistocene, perhaps Pliocene, then the Bristol Avon, and hence also the gorge, were developed in Pleistocene times.

Thus, according to Davis, Buckman, Sanders, Varney, and others, the reversal of drainage of the Avon was effected by river capture associated with the headward erosion of the Severn, which became a vigorous, subsequent river pushing north-eastwards along the soft rocks of the Vale of Severn.

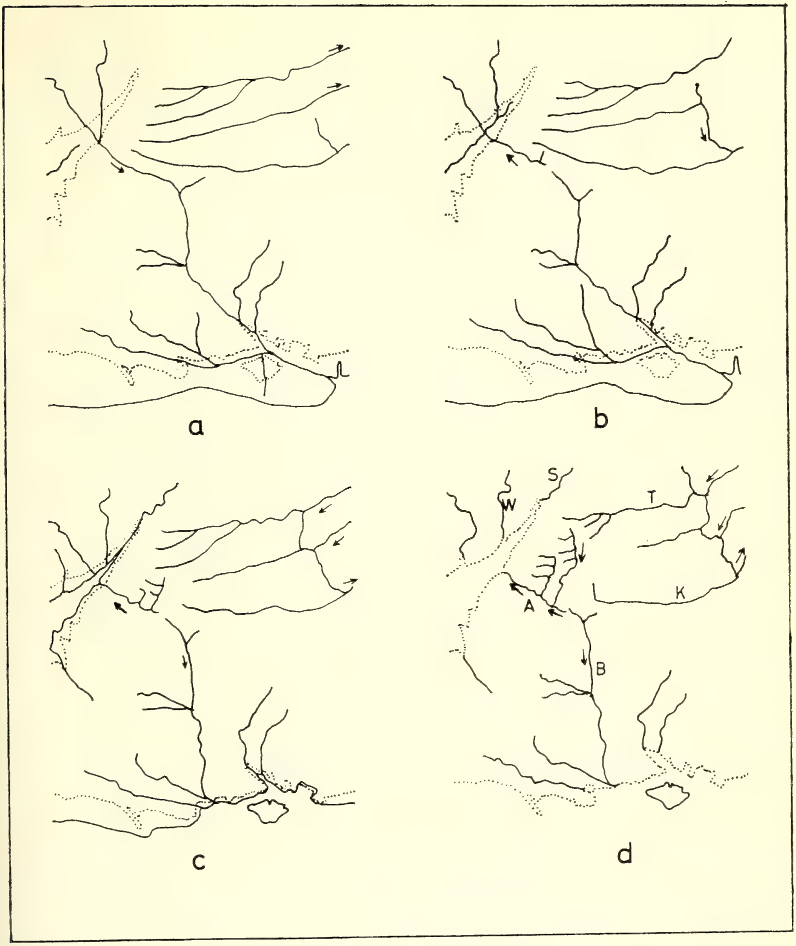

FIG. 7. (a–d). *Varney's reconstruction of the river development.*
Present day coast line dotted. W – Wye, S – Severn, T – Thames, A – Avon, K – Kennet, B – Salisbury Avon.

This rapid extension of the lower Severn may well have been due to the establishment of the Bristol Channel in Miocene times by the folding of the Mesozoic rocks on east-west and perhaps north-east / south-west axes, thus forming a new trough on an old line. This area was certainly the site of an east-west depression during Permian and Triassic times which was filled in by debris derived from both north and south. By drawing contours for the Rhaetic-Lias junction, either actual or estimated, Jones (1930) was able to show that in both the

Vale of Glamorgan and in the Mendip region there has been considerable folding of this surface so that, e.g., it reaches 850 ft. above O.D. on Mendip, declines to 500 ft. around Wells, and to 200 ft. below O.D. at Glastonbury (Fig. 8). More recent work (Green and Welch 1965) confirms this tectonic activity but shows that the base of the Rhaetic reaches more than 1,000 ft. below O.D. in the central Somerset Basin, giving a fold amplitude of nearly 2,500 ft. In spite of criticism of this method of determining the warping of the surface because of doubts about its original horizontality, it does seem to be well established that the Miocene folds clearly seen in the south-east of England can be traced into the Bristol Channel region and that they led to the development of this embayment opening out westwards to the sea. This down-folding together with rapid erosion by the Severn thus initiated an arm of the sea, the Bristol Channel, with low-lying land at its head. The exact date of these events is uncertain but there seems little doubt that by the beginning of the Pliocene and perhaps earlier there were no rivers flowing across the Bristol Channel-Severn estuary and the south-easterly flowing Welsh rivers and obsequent rivers from the Cotswolds were flowing into the Severn.

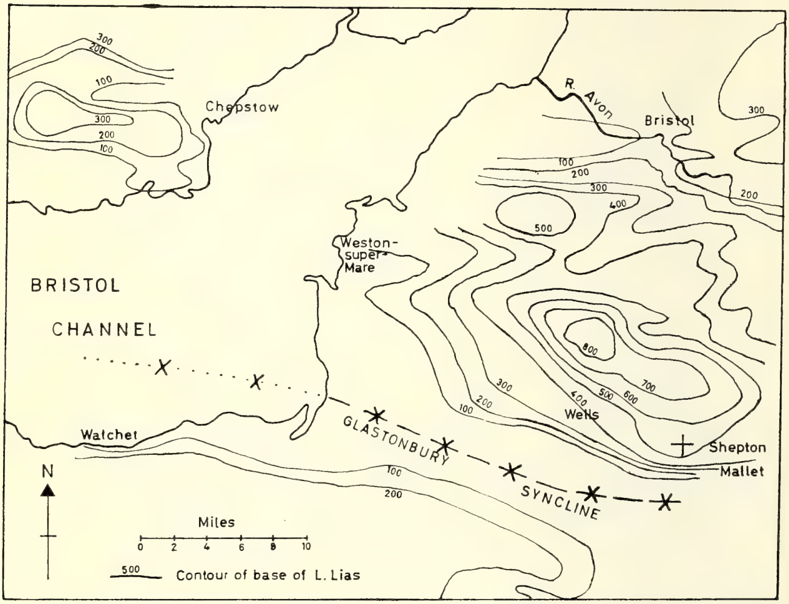
300
200
100
300
200
100
Chepstow
R. Avon
Bristol
300
100
200
300
400
500
200
Weston-super-Mare
BRISTOL
CHANNEL
800
700
600
500
400
300
200
100
Wells
Shepton Mallet
Watchet
GLASTONBURY
SYNCLINE
100
200
N
Miles
0 2 4 6 8 10
500 Contour of base of L. Lias

FIG. 8. *Post-Mesozoic folding shown by the base of the Lias (after Jones).*

PLEISTOCENE SURFACES

When the Pliocene Sea transgressed over the British Isles, this gulf was flooded and the sea encroached on the ground on either side. Trueman (1938) demonstrated the existence in the Bristol district of a series of erosion levels at about 750–850 ft., 550–600 ft., 440–450 ft. and 200–300 ft. and Driscoll (1958) found similar levels at the other side of the channel in the Vale of Glamorgan. These flattish areas, now much dissected by the current cycle of erosion, can be seen in the following places: the 750–850 ft. level on the Mendip and Cotswold high summits, the 550–600 ft. on Broadfield Down and the northern Mendips, the 400–450 ft. at Chew Magna, Nibley, Farrington Gurney-Nunney, the 200–300 ft. in the Knowle-Barrow Gurney district, Durdham Downs—Patchway, Leigh Woods—Queen Charlton. The last level is by far the most widespread.

He considered these to have been wave-cut platforms eroded by the sea during Pliocene and Pleistocene times at periods when sea level was much higher than it is now though the higher levels may have been produced by sub-aerial agencies. One of the big problems here is to what extent these surfaces are of comparatively recent marine and sub-aerial origin and to what extent they are exhumed Mesozoic surfaces etched out when the Jurassic seas were encroaching on the Armorican lands. There are certainly large areas of almost horizontal Liassic rocks but if the Miocene folding is accepted as proven, the marine erosion surfaces of the Jurassic should be warped. Wooldridge (1950) claimed that the planation potential of the Tertiary has been underestimated and suggested that perhaps surfaces up to 600 ft. are marine.

According to Trueman, at the 300 ft. stage the mouth of the Avon was not far below Bath and as the sea retreated the river flowed out towards the Severn across an uplifted sea-floor which perhaps had no covering of sediments or at best only a thin layer. This, according to Trueman, is the stage at which the gorge was cut, i.e. post the 300 ft. platform, and as the sea level fell further so the valley was deepened and the river perhaps began to cut its way across another platform. This process is graphically described by George (1942) in his account of rivers in South Wales—'The rivers therefore grew in length by downstream advancement across the newly-emerged coastal shelf with each successive uplift and marine regression . . . . [in] directions largely controlled by the nature and degree of regularity of the exposed marine beach . . . . generally they tended to lie more or less normal to the contemporary shore-line.'

This seems to be a reasonable explanation for the westerly flow of the Avon and for the Clifton Gorge but it still does not account for the breaching of the Cotswolds by the river. A possible mechanism however can be deduced from an account by Wooldridge (1961) of the Radstock Plateau in which he draws comparisons between the denudation chronology of south-eastern England and that of the Bristol area. Most important in the present context is his suggestion that the Pliocene sea (in recent work this has become Plio-Pleistocene, Calabrian, in age) transgressed from the south-east through the Wylie Valley in Wiltshire and flooded into Somerset and the valley of the Bristol Avon, thus perhaps establishing a link with the sea already flooding the Bristol Channel and Severn Estuary from the west. The 600 ft. marine platform cut during this transgression can be seen in the Wylie Valley and it is just possible that a shoreline to this sea can be traced near Lansdown, Bath.

Further evidence is provided by a number of more or less concordant summit levels at about 600 ft. in north-east Somerset, two of which are at Farleigh and Bathampton Downs. The gravels there could well, therefore, be marine and of local origin, not fluviatile and derived from South Wales as suggested by Varney and others, though Wooldridge suggests that a glacial origin cannot be ruled out. In this latter case the gravels may be early Pleistocene as on the 600 ft. platform farther to the east.

Fig. 9 shows the coastline during the Pliocene (Calabrian), when

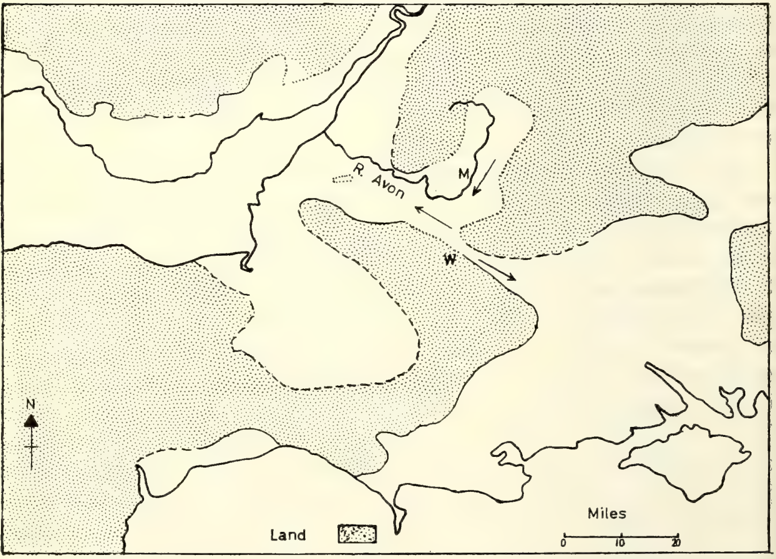

FIG. 9. *The shoreline of the Calabrian (650 ft.) sea based on Wooldridge (1961).* Present day coast line shown. The arrows indicate the direction of the marine regression. M – Melksham, W – Warminster.

sea level was roughly 600 ft. higher than at present, as reconstructed by Wooldridge with additions by the writer. Rivers flowed down the dip-slope of the Cotswolds into the gulf over what is now the low ground round Melksham. As its level fell the sea retreated down what are now the Wylie and Avon valleys leaving a ridge of higher ground separating the two gulfs near Warminster and marine cut platforms gently shelving both to west and south-east. The drainage of the Melksham vale followed a westerly course towards the sea over the Calabrian platform cut across the Cotswolds near Bradford. It is difficult, however, to fit the north-easterly flow of the Cam and Wellow brooks, the latter flowing through Radstock, into this simplified pattern. During still-stands of sea level at perhaps 400–450 ft. and again at about 300 ft. further wave-cut platforms were formed and with each regression the sea moved further to the west over the Bristol area exposing successive platforms as it did so. The Avon, cutting down to keep pace with the falling sea level, thus eroded through the various platforms and gave rise to gorges whose depths vary according to the age of the platform into which they are cut—at least 450 ft. near Bath and about 300 ft. at Bristol.

Since the 300 ft. platform is clearly much younger than the Calabrian 600 ft. platform, Wooldridge suggested that it was cut by the sea during the first interglacial period and that the gorge at Clifton was initiated on this surface in response to the falling sea level of the Second or Antepenultimate glaciation. Thus, the most recent account ascribes the youngest age to the beginning of the cutting of the gorge and is the latest in a line ranging from 'perhaps not before Tertiary' (Callaway 1901) to Pliocene (Greenly 1947; Varney 1921).

A Pleistocene age for the cutting of the gorge depends on the dating of the various levels and Wooldridge does not follow up the implications of his suggestions for local Pleistocene chronology. Mitchell (1960), adapted by Kidson (1964), puts the highest sea level in the Pleistocene as 200 ft. above O.D. and Wills' work (1938) on the Severn during the Glacial period suggests something similar.

The later Pleistocene history of the lower parts of the Avon can be deduced from the patchy spreads of river gravels found below Bath (Davies and Fry 1928; Fry 1956; Palmer 1931). Terraces found at about 270 ft. at Leigh Woods, 100 ft. at Bath, Brislington and Ham Green, 50 ft. at Saltford, all mark progressive downcutting of the Avon to keep pace with falling sea level and during these times much of the softer rock in the Bristol district was removed by erosion to give the broad basins around, for example Keynsham, Bristol and Flax Bourton. In the Forest Period, the sea retreated to a level at least 100 ft. below O.D. so that the coast line in the Bristol Channel was west of a line from Minehead to Bridgend (see North 1955). To keep pace with this regression the Avon cut a deep channel, the bed of which is at 19 ft. and 45 ft. below O.D. at Bristol and at Avonmouth respectively. The final episode was the raising of sea level, the so-called Flandrian transgression, which flooded the Bristol Channel and Severn Estuary and once again brought tides up the Bristol Avon and through the gorge.

CONCLUSION

The gorges of the Avon at Clifton, Hanham, and Bath have been cut by the river since the beginning of the Pleistocene. The drainage is superimposed, that at Bath being on an early Pleistocene or Calabrian marine erosion surface (the 600 ft. platform), and at Hanham and Clifton on the 300 ft. surface possibly cut during the first interglacial period. In response to variations in sea level, the river has in later Pleistocene times considerably modified these flat marine platforms, removing considerable quantities of the softer rocks to produce, for example, the basin in which much of Bristol now stands and leaving only remnants of the original flat surfaces.

While the Severn played a part in the capture of the original south-easterly flowing consequents on the Chalk and probably later surfaces, it is unlikely that the Avon is an obsequent stream related to this process. The erosion effected by the Severn system, however, was of considerable importance in establishing low ground which was flooded by late-Pliocene and Pleistocene transgressions, thus enabling the sea to produce wave-cut platforms on which the drainage was superimposed.

It seems unlikely that any major part of the present drainage system was superimposed on a Mesozoic surface or on Mesozoic rocks.

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DISSEMINATED GALENA IN RHAETIC SHALES AT ALMONDSBURY, NEAR BRISTOL

By D. Hamilton

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During the construction of the London—South Wales Motorway (M4), Rhaetic shales containing galena were collected from a cutting (Grid Ref. ST/61408457) four hundred yards east of the overhead bridge carrying the A38, about a mile north of Almondsbury, which lies to the north-west of Bristol (see map, Whittard 1949). These shales contain scattered cubes of galena but the sediment, in hand-specimen, appears to differ little from other Rhaetic dark shales in the area. The interest in this occurrence centres round the possible modes of origin of isolated galena cubes disseminated through the lower part of the Rhaetic Westbury Beds.

Galena is commonly associated with the Carboniferous Limestone in the Bristol and Mendip area (Green 1958), the mineralization following fissures, faults and joints. The typical mineral association is galena, sphalerite and pyrite with calcite and barite. Galena is also present in the Dolomitic Conglomerate (Kingsbury 1941; Stoddart 1877; Whittard 1948, p. 328) and in the Keuper Marl, though no previous records of galena occurring in Rhaetic sediments of the Bristol area are known. Dr. M. L. K. Curtis, Bristol Museum, has collected galena cubes in Westbury Beds from a borehole in Southmead, Bristol (Specimen Da 5600, Bristol Museum). Galena is recorded in Rhaetic, Lias and Lower Oolite rocks in the Mendips (Dewey 1921). Possible modes of origin for the lead vein deposits in the Mendips are discussed by Dewey (1921), Dunham (1952) and Green (1958).

The occurrence of scattered galena cubes in the Westbury Beds in the M4 road cutting is sufficiently different to suggest alternative modes of origin. These could include: (1) a detrital origin, (2) a syngenetic origin by bacterial activity, (3) an authigenic origin, (4) impregnation by ore-bearing fluid.

(1) **Detrital Mode of Origin.** The galena cubes are confined in the outcrop to a band three inches thick, two feet three inches above the base of the Westbury Beds. The band was traced laterally

about twenty feet. The cubes occur singly, are simple and entire, and range in size from 2 mm. to 0.2 mm. In all cases the edges and corners are sharp and unrounded. The enclosing sediment is a fissile silty shale.

The obvious source of detrital grains of galena is from the erosion of Carboniferous Limestone. This presupposes that mineralization of the pre-Rhaetic strata had already taken place. A specimen of Rhaetic Bone Bed collected by the writer from Aust Cliff has a pebble of Tea Green Marl containing galena, but none is present in other pebbles or the matrix. From a study of lead isotope abundance in galena, Moorbath (1962) concluded that the main mineralization in the Mendips was of Triassic age. Erosion at the beginning of the Rhaetic is indicated by the locally derived conglomeratic Bone Bed underlying the galena-bearing shales at the M4 outcrop. No fragments of galena have been found in these coarse sediments. There is no detrital component in the galena-bearing shale that could be the hydraulic equivalent of the heavy lead sulphide.

(2) **Syngenetic Origin.** The shales have abundant minute carbonaceous fragments studded with micro-granules of pyrite, and dark waxy brown sapropel, usually forming flakes or sheets lying more or less parallel to the laminations in the sediment. Under high magnification abundant cylindrical and coccoid structures, possibly bacteria, sometimes arranged in strings, are present in a translucent brownish and structureless groundmass.

The presence of this organic material raises the possibility that lead sulphide could have been deposited in a reducing environment within the sediment through the action of bacteria, whilst interchange between the Rhaetic sea and the sediment persisted. Since the occurrence of galena in the shales is limited both vertically and laterally, there could have been a purely local enrichment in lead from the weathering of nearby lodes. Bass Becking and Moore (1961) have precipitated experimentally the sulphides of most of the common metals, including lead, using cultures of the sulphate-reducing bacteria *Desulfovibrio desulfuricans*.

(3) **Authigenic Growth.** Lead can be concentrated by adsorption on organic material, which could give rise to well developed cubes of galena but insufficient analytical data on the specimens are available at present to draw any conclusions. Authigenic growth is a possible mechanism by which such cubes of galena could form.

(4) **Impregnation Mineralization.** The other occurrences of galena in the area can be grouped readily into fissure and replacement deposits, and impregnation deposits with accompanying bleaching of argillaceous sediments. Field evidence at the outcrop

failed to reveal any veins, fissures or paths of impregnation, nor other minerals in the shale such as calcite, barite and pyrite, which commonly accompany galena.

On the opposite side of the road a fault (Whittard 1949) with a down-throw of about 12 feet to the east brings Westbury Beds into contact with Carboniferous Limestone series, but no galena was found in the shales adjacent to the fault.

The Tea Green Marls below the Westbury Beds are unusually hard as secondary silica has permeated the rock by following crystal and grain boundaries. The detrital quartz grains are slightly corroded when adjacent to calcite but no instances of authigenic quartz overgrowths were seen. Late stage vugs are lined with pyrite and drusy calcite, suggesting alteration by mineralizing fluids.

In order to determine if there are any major differences in the chemical composition of the shale enclosing the galena cubes, a partial chemical analysis was made using a Philips X-ray fluorescence spectrometer of the galena-bearing shale (DH 670) and also of a lithologically similar Rhaetic shale from Aust Cliff, Glos. (DH 677).

	SiO_2	Al_2O_3	TiO_2	Fe°	MgO	CaO	Na_2O	K_2O	MnO	P_2O_5	S
DH 670	55.65	20.21	0.76	5.76	2.02	0.52	0.26	5.06	0.05	0.06	2.63
DH 677	54.39	19.92	0.77	6.78	2.21	0.48	0.20	5.64	0.07	0.05	3.66

Fe_2O_3/FeO content not determinable due to high organic content. Total loss on ignition: DH 670 17.43%; DH 677 13.50%.

No significant differences are apparent.

Trace element compositions in p.p.m. are as follows:

	Cl	Sc	Cs	Ba	Ce
DH 670	180.7	17.9	36.3	441.0	74.7
DH 677	149.5	16.1	32.0	414.4	68.8

The barium content is not abnormally high compared with that of other sediments in the area, but sufficiently high to suggest local enrichment by mineralizing fluids for barite frequently accompanies galena in fissure deposits.

The minor element composition of the galena cubes from the Westbury shales and from undoubted mineralized zones in the Carboniferous Limestone and Dolomitic Conglomerate was compared by spectrographic analysis. This revealed the presence of both antimony and silver in the Rhaetic galena as well as the fissure deposits (cf. Carlton 1959). This points strongly to deposition of galena from mineralizing fluids for it is improbable that a minor element composition similar to the fissure deposits could occur if the galena was of syngenetic or authigenic origin. Even if the origin is by impregnation, the absence of any bleaching or alteration of the organic material in the shale, the absence of the usual mineral suite accompanying galena and the cause of scattered nucleation of the crystals in the shale still pose interesting problems.

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	Waring, Mrs. W. J.	Do.
	Westwood, Miss M., B.Sc.	59 Devonshire Road, Westbury Park, Bristol 6
	Wills, H. H. F.	10 Blenheim Road, Redland, Bristol 6

CHANGES OF ADDRESS

Atkins, P. R.	39 Shelley Avenue, Paulsgrove, Portsmouth, Hants.
Bebbington, A., B.Sc., M.I.Biol.	13 Red House Lane, Westbury-on-Trym, Bristol
Brain, Mrs. M.	15 Overhill, Pill, nr. Bristol
Chapman, Miss A. R., B.Sc.	16 Osborne Villas, St. Michael's Park, Bristol 2
Charlesworth, W. B.	36 Albert Road, Clevedon, Somerset
Clarke, H. M., B.A.	41 Valley Road, Clevedon, Somerset

	Court, J. L.	3 Grange End, Sprats Bridge, Chew Magna, nr. Bristol
	Dennison, V. D., B.Sc.	Heathercrest, The Batch, Churchill, Somerset
C.	Donovan, Prof. D. T., Ph.D., D.Sc., F.L.S., F.G.S.	Dept. of Geology, University College London, Gower Street, London, W.C.1
	Elliott, Mrs. W. E.	55 Effingham Road, Bristol 6
	Geary, W. A.	10A Eastfield Road, Cotham, Bristol 6
	Hawkins, P. G.	5 The Mount, Studland, Dorset
C.	Holmes, W. A.	Treworvas, 3 Graham Avenue, St. Austell, Cornwall
	Hull, Miss I. O.	580 Wells Road, Bristol 4
	Ilott, E.	24 Montague Hill, Kingsdown, Bristol 2
	Ilott, Mrs. E.	Do.
A.	Mathieson, A. M.	11 Edward Road West, Clevedon, Somerset
H.	Matthews, Dr. L. Harrison, M.A., D.Sc., F.R.S., F.L.S.	The Old Rectory, Stansfield, Sudbury, Suffolk
C.	Merrie, T. D. H., B.A.	Airth Castle, by Falkirk, Stirlingshire
	Morgan, Miss D. C., B.Pharm., M.P.S.	Pharmacy Dept., Southmead Hospital, Westbury-on-Trym, Bristol
	Morgan, H.	2 Quarry Way, Nailsea, nr. Bristol
	Morgan, Mrs. H.	Do.
	Morgan, J. S.	40 College Road, Clifton, Bristol 8
C.	Neville, R.	4 Shirecliffe Close, Pitsmoor, Sheffield 3
	Nicholls, W. T., A.M.I.Mech.E., A.F.R.Ae.S.	3 School Estate, Chew Stoke, nr. Bristol
	Nicholls, Mrs. W. T.	Do.
	Pickrell, D. G.	The Dunelm Hotel, Great George Street, Bristol 1
	Poulding, R. H.	Barleycombe Lodge, Christon, nr. Axbridge, Somerset
	Poulding, Mrs. R. H.	Do.
	Pugsley, J. B.	Two Elms, The Close, Cribbs Causeway, Bristol
	Roberts, J. T.	11B Miles Road, Clifton, Bristol 8
	Sanders, J. D., B.D.S.	Quarme, 36 South View Way, Prestbury, Cheltenham, Glos.
A.	Thomas, P. T.	Lindisfarne, Ubley, nr. Bristol
	Vance, Mrs. F. M.	1 Station Road, Nailsea, nr. Bristol
	Webber, Miss N. D.	Camlann, Millbourne Road, Cheddar, Somerset
	Winchester, Miss A.	8 Priory Road, Portbury, nr. Bristol
	Withers, Miss D.	Middlegarth, Wellow Lane, Hinton Charterhouse, Bath, Somerset

REPORT OF COUNCIL
1966

THE membership at the end of the year was 740, including 64 juniors. There are 14 affiliated societies.

At the Annual General Meeting F. R. Sterne was elected as President. The other Officers and Members of Council were also elected. The usual full and vigorous programme of lectures and expeditions has been maintained during the year and the Society again supported National Nature Week with a Nature Trail in Leigh Woods. Fewer people availed themselves of the brilliantly illustrated and directed walk, although about the same number of school-children attended. A successful Annual Dinner was held and attended by about 80 members and guests.

The work of surveying special areas for conservation has continued throughout the past year to the position that most leaders report they are well on the way to submitting full reports. However, help is still required on mammals and, in some cases, the entomological side is also lacking. Manual conservation has not been undertaken as yet, but recommendations will arise from the reports. The conservationists were greatly encouraged by the results of their efforts in preventing a funicular railway from being installed and operated in the Cheddar Gorge and they have now taken up the cause of trying to save Crook Peak from the quarrymen.

We announce with regret the deaths of the following members: Mrs. E. I. G. Chadwick, Mrs. G. E. Williams, Mr. A. J. Mizen, and a former President, Professor W. F. Whittard, elected member in 1938, and President in 1952–3.

GWYNNETH STERNE, *Hon. Secretary.*

REPORT OF ENTOMOLOGICAL SECTION
1966

THE Annual Business Meeting was held on 15 March, when the following were elected: President, Mr. K. H. Poole; Secretary, Mr. P. F. Bird; Committee, Mrs. A. J. Hollowell, Messrs. C. Blathwayt, J. F. Burton, D. J. Foxwell, D. G. Gibb, M. Kendall, N. A. Watkins.

During 1966 the following meetings were held:

Jan. 11:	Viewing British Lepidoptera collections at the City Museum.
Feb. 15:	Tiger Beetles, by Mr. J. E. Cooper.
Mar. 15:	Annual Business Meeting. British Grasshoppers and Crickets, by Mr. J. F. Burton.
May 28:	Field meeting, Charterhouse-on-Mendip: Mr. D. J. Foxwell.
June 11:	Field meeting, light-trapping, Leigh Woods: Mr. D. J. Foxwell.
June 15:	Field meeting, Walton-in-Gordano: Mr. K. T. Batty.
Sept. 10:	Field meeting, light-trapping, Leigh Woods: Mr. D. J. Foxwell.
Oct. 11:	Films *The Rainbow and the Forest* and *The World of Grasshoppers*.
Nov. 8:	Annual Exhibition at the City Museum.

P. F. BIRD, *Hon. Secretary.*

The Hon. Treasurer in Account with the Bristol Naturalists' Society

Dr. RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31 DECEMBER, 1966 *Cr.*

1965 £ s. d.			£ s. d.	£ s. d.	£ s. d.
606 19 0	To Members' Subscriptions: Full Members	1965	2 10 0		
		1966	583 19 6		
		1967	25 12 6	612 2 0	
57 10 0	,, ,, of the same household	1966	58 18 9		
		1967	1 17 6	60 16 3	
16 5 0	Corresponding Members	1966	13 15 0		
		1967	12 6	14 7 6	
16 0 0	Associates	1966	15 0 0		
		1967	12 6	15 12 6	
14 10 0	Juniors	1966		22 15 0	
25 5 0	Affiliated Societies	1966		21 10 0	747 3 3
736 9 0					
	,, *Proceedings* (1965):				
	Grants, authors' contributions		148 7 9		
	Separates		64 17 2		
	Subscribers		5 1 0		
	,, Sales of Publications		6 11 6		
102 0 3					224 17 5
838 9 3					
12 16 9	,, Field Committee: surplus over expenses				– – –
3 11 6	,, Sale of Badges				11 0
1 1 0	,, Profit on dinner				5 6
3 2 0	,, Interest on deposit in Post Office Savings Bank				3 3 6
20 14 10	,, ,, ,, Defence Bonds and National Development Bonds				23 15 9
879 15 4					
31 5 8	,, Members' contributions to "Harry Savory" Fund				12 6
					1,000 8 11
645 6 4	,, Balance from last account				655 18 8
£1,556 7 4					£1,656 7 7

1965 £ s. d.		£ s. d.	£ s. d.
140 13 0	By General Printing and Stationery	139 1 5	
121 15 1	,, Postages and telephone	132 2 7	
15 0	,, Bank Charges, cheque books	3 2 6	
12 0 0	,, Clerical assistance	12 0 0	286 6 6
275 3 1			
445 6 5	,, *Proceedings* (1965, including separates)		487 11 4
35 16 6	,, Books	15 15 6	
28 0 0	,, Bookbinding	29 5 0	
30 9 6	,, Periodicals	30 10 6	
1 0	,, Rent (of library room)	1 0	
4 19 0	,, Fire insurance (library)	4 19 0	80 11 0
	,, Subscriptions:		
2 10 0	,, Council for Nature, etc.	2 10 0	
3 6 0	,, South Western Naturalists' Union	3 13 0	
– – –	Steep Holm Trust	18 0 0	24 3 0
8 10 0	,, Fares and expenses of general meetings		36 9 6
– – –	,, Field Committee: excess expenditure		5 19 0
1 7 2	,, Loss on coffee service		1 8 8
– – –	,, Nature Trail in Leigh Woods		17 3 2
65 0 0	,, Grants to Sections:		
	Botanical	15 0 0	
	Entomological	10 0 0	
	Geological	15 0 0	
	Ornithological	25 0 0	
	Junior	5 0 0	70 0 0
900 8 8			
	,, Balances to next account:		
3 0	Cash in hands of Hon. Treasurer	1 5 0	
37 17 4	*Cash in bank	30 7 7	
127 11 9	Deposit in Post Office Savings Bank	30 15 3	
200 0 0	£200 5% Defence Bonds	200 0 0	
230 0 0	*£330 5% National Development Bonds	330 0 0	
60 6 7	In hands of Field Committee	54 7 7	646 15 5
£1,556 7 4			£1,656 7 7

*Including "Harry Savory" Fund £34 3s. 0d.

NOTE.—These accounts do not record balances held by sectional treasurers and the Ornithological Section Special Fund of £65 12s. 0d.

P. J. M. NETHERCOTT, *Hon. Treasurer,*

Audited and found correct, A. E. BILLETT, *Hon. Auditor,*

REPORT OF BOTANICAL SECTION 1966

AT the Annual Business Meeting in the Small Geology Lecture Theatre of the University on 10 January, 1966, the following officers were elected: President, Dr. T. E. T. Bond; Secretary and Treasurer, Miss I. F. Gravestock; Committee: Mrs. C. H. Cummins, Dr. A. F. Devonshire, Mr. J. A. Eatough, Dr. R. M. Harley, Mrs. I. C. I. Milton, Mr. P. J. M. Nethercott, Miss A. M. Sampson and Dr. C. E. D. Smith.

The Wild Plant table at the Bristol Museum continued to be much appreciated; thanks are offered to Mr. A. Warhurst and Mr. P. F. Bird of the Museum and to Mrs. G. S. Wakefield, Mr. E. S. Smith and Mrs. C. H. Cummins as well as to all members who contributed specimens.

The following winter meetings were held during the year:

Jan. 11: Annual Business Meeting, followed by exhibits and short papers by Members.
Feb. 14: Films—*Blagdon Trout* and *Chew Valley Inauguration* by Bristol Waterworks Company.
Mar. 14: Alpines in Cultivation, by Mr. E. B. Anderson.
Oct. 24: Members' Evening, with transparencies.
Nov. 21: Some Aspects of Nature Conservation in South-West England, by Mr. W. O. Copland.

The following field excursions took place, under the leadership of those shown:

Apr. 30: Bath Botanical Garden. Dr. T. E. T. Bond.
May 4: Avon Gorge and the Gully. Dr. A. F. Devonshire.
May 21: Steep Holm. Mr. P. J. M. Nethercott. *Paeonia mascula* was seen.
May 25: Humpy-Tumps, Keynsham. Dr. A. F. Devonshire.
June 11: Cheddar Gorge and Charterhouse district. Mr. C. H. Cummins. A little known locality for *Dianthus gratianopolitanus* was explored, and *Geranium phaeum* seen at Charterhouse.
June 15 Markham Valley. Dr. T. E. T. Bond.
July 2: Brassey Nature Reserve and Hidcote. Mrs. S. C. Holland (North Gloucestershire Naturalists' Society and Chairman of the Reserve) and Miss I. F. Gravestock. Brassey comprises a stretch of fresh-water marsh and oolitic limestone grassland. *Carex dioica*, *Astragalus danicus* and *Thesium humifusum* are found here, with *Thlaspi perfoliatum* and the hybrid *Dactylorhiza fuchsii* × *praetermissa*. Hidcote is noted for the 'stilt' hedges of *Carpinus betulus*, the red borders and many exotic trees and shrubs in a variety of habitats.
July 30: Mynydd y Glew. Mr. P. J. M. Nethercott.
Aug. 17: Sneyd Park to Sea Mills. Mr. P. J. M. Nethercott.
Sept. 17: Dolebury Warren and Mendips. Mrs. N. Vaughan Davies.

I. F. GRAVESTOCK, *Hon. Secretary.*

HON. LIBRARIAN'S REPORT 1966

DURING the year 145 books and periodicals were borrowed by 40 members. It should be emphasized that these figures take no account of volumes consulted in the library.

16 new books, listed in the monthly bulletin, were purchased.

R. BRADSHAW, *Hon. Librarian.*

REPORT OF GEOLOGICAL SECTION

1966

THE Annual Business Meeting of the Section was held on 13 January 1966 and the following officers were elected: President, Mr. R. G. Payne; Vice-President, Mr. R. Bradshaw; Hon. Secretary, Mr. M. D. Kamm; Hon. Field Secretary, Mr. D. Hamilton; Committee: (the late) Professor W. F. Whittard, Professor F. Coles Phillips, and the Student President of the Geological Society of the University (*ex-officio*), Mr. D. Addison, Mr. R. Ashley, Dr. J. W. Cowie, Mr. I. Ford, Mr. C. E. Leese, Mr. W. Stock, Mr. F. Stenhouse Ross, Mr. D. Vowles. The section notes with deep regret the death of Professor Whittard on 2 March; a full obituary appeared in the last volume of the PROCEEDINGS. After the business of the meetings, the President showed the section two films. Other lecture meetings were:

Feb. 17: Mr. D. Hamilton, University of Bristol: Geological Exploration of the Sea Floors. The speaker first described the general topography of the ocean beds, and then the economic and academic reasons for investigating their geology. He concluded by discussing, with the aid of a film, the work of the Bristol Geology Department in studying the bed of the Western Approaches to the English Channel.

Oct. 27: Dr. D. Bassett, National Museum of Wales: Geology and Geologists in Wales and the Welsh Borders. Dr. Bassett described the history of the study of the geology of Wales, paying particular attention to the controversy between Sedgwick and Murchison over the classification of Ordovician rocks. He concluded by mourning how little of Wales had been resurveyed in the last hundred years.

Nov. 24: (Joint Meeting with Mammal Section). Dr. R. J. G. Savage, University of Bristol: the Evolution of Man. Dr. Savage discussed research of the past 20 years into the evolution of man, pointing out the gap in fossil evidence in the Oligocene and Pliocene.

The following Field Meetings took place in the year:

Apr. 23: Wells Museum and Wells Cathedral: leader, Dr. F. S. Wallis.

May 21: Volcanic Rocks of Weston-super-Mare: leaders, Messrs. R. J. Howarth and G. L. Hendry.

June 25: Celestine Workings and Chipping Sodbury: leader, Mr. D. Hamilton.

July 24: Cretaceous Rocks at Chard and Beer: leader, Mr. R. Ashley.

Oct. 2: Silurian Rocks and Fossils of the Woolhope Area: leader, Dr. J. W. Cowie.

M. D. KAMM, *Hon. Secretary.*

REPORT OF ORNITHOLOGICAL SECTION 1966

'THE WREN
THE WREN
THE KING OF
ALL BIRDS..'

AT the 42nd Annual Business Meeting in January, Mr. R. H. Poulding and Mr. S. M. Taylor were re-elected as President and Hon. Secretary respectively. Mr. R. Prytherch and Mr. D. Shepherd were elected to the Committee in place of Mr. B. King and Mr. R. F. Thearle. The remaining members were Miss C. Graham and Messrs. K. Fox, M. Kendall, H. W. Neal and G. Sweet.

Messrs. P. J. Chadwick and H. H. Davis were re-elected to the Section's Editorial Committee and Messrs. H. R. Hammacott and R. J. Prytherch were elected to it for the first time.

Seven indoor meetings were held, with an average attendance of 73, the lowest (39) at the Annual Fieldwork Meeting and the highest (104) in December. The speakers and their subjects were:

Jan. 14: Annual Business Meeting; Autumn Behaviour in the Dunnock, by Mr. R. H. Poulding.

Feb. 9: An Ornithological Frolic—Birds as Men and Men as Birds, by Mr. J. Boswall.

Mar. 11: An Expedition to Morocco, Spring 1965, by Mr. J. D. R. Vernon.

Mar. 23: Annual Fieldwork Meeting.

Oct. 12: Bird Pathology, by Dr. J. V. Beer.

Nov. 11: Bird Art and Bird Illustration, by Mr. R. Gillmor.

Dec. 14: Joint Meeting with the British Trust for Ornithology; With the Migrants to Iberia, 1965, by Mr. C. J. Mead.

The R.S.P.B. films, *A Place for Birds* and *Birds of Strathspey*, were shown at a public meeting on Sept. 23, and an informal meeting, with talks and exhibits by members, was held on Nov. 25.

There were field meetings at Brean Down (Apr. 24), Leigh Woods (May 11), Chew Valley Lake (Sept. 3) and a migration watch at various points (Oct. 22); two other field meetings, Oakford, near Bath, and on Steep Holm, were cancelled for lack of support. An all-day visit was paid to Dawlish Warren on Sept. 25. We are grateful to all who acted as leaders and otherwise helped at these meetings.

Small numbers of members again took part in the B.T.O.'s Common Birds Census and Nest Record Schemes (the latter being organized locally for us by Mr. H. R. Hammacott) and in the Section's breeding-season census of Shelduck, Bird-of-Prey study, and a sample census of Rookeries. The Survey of Bristol Birds continued to flourish under the care of Miss C. Graham, and a full-page article on it appeared in the *Bristol Evening Post*. The Bristol Ringing Group completed its first full year of operation, and its first trainee qualified.

Mr. J. F. Rowe actively represented the Section on the Committee which organized the Leigh Woods Nature Trail.

Mr. Poulding resigned from the office of President at the end of June for personal reasons, and in late July ill-health forced the Secretary to relinquish his duties for three months, during which time the Assistant Secretary, Mr. K. Fox, acted for him. Mr. D. Shepherd acted as Chairman from September until the end of the year.

S. M. TAYLOR, *Hon. Secretary.*

REPORT OF MAMMAL SECTION 1966

THE formation of the Mammal Section was officially sanctioned by Council on 22 Feb. 1966. At an inaugural meeting on 6 May Dr. R. J. G. Savage was elected President, Miss A. R. Chapman Secretary and Treasurer, and Miss B. E. Jones kindly agreed to continue her work as Local Recorder for the National Mammal Survey.

The Mammal Group met informally in 1965 to discuss participation in the National Mammal Survey. This is a very important activity of the Section and is supported by an enthusiastic, though small group of members. In connection with the Badger Survey Dr. Neal particularly requested that a detailed study should be made of the Mendips and he has been very encouraging about our efforts so far.

During 1966 the following meetings were held:

May 17: Construction of Small Mammal Live-traps (based on design by Mr. D. J. Hughes).
June 8: Evening field meeting, including small mammal trapping and a badger watch. Leader: Mr. A. F. Jayne.
June 9: Indoor meeting to extend field observations and trapping results.
July 9: Westbury Wildlife Park. Leader: Mr. D. Chaffe.
Sept. 17: Badgers on Mendip. Leaders: Mr. McGregor and Miss A. R. Chapman.
Nov. 24: The Evolution of Man, by Dr. R. J. G. Savage (Joint meeting with Geology Section).

ROSALIND CHAPMAN, *Hon. Secretary.*

REPORT OF JUNIOR MEETINGS 1966

THERE were twelve Junior Field meetings and six Indoor meetings during 1966. On 23 Jan. Blagdon Lake was visited and on Feb. 19 Brockley Combe. On 6 Mar. members (23) set off for the Wildfowl Trust led by Mr. B. King and Mr. M. Kendall. Mr. R. H. Rawlings took a party through Failand on 20 Apr. and on 30 Apr. Mr. H. F. Flook led a party over the Tealham Moors. The meeting on 15 May started at 6 a.m. at Goblin Combe for the Dawn Chorus—bird songs being ably distinguished by Mr. M. Kendall. On 28 May an all night trip to Exmoor was organized by Mr. H. G. Hockey. Two Juniors led a walk on Spaniorum Hill on 25 June and on 23 July Mrs. Scawin led a party of seventeen members to Knole Hill, Almondsbury. Mr. R. M. Curber took members bird-watching from Highbridge on 24 Sept. and on 15 Oct. Dr. C. E. D. Smith led a most successful Fungus Foray in Leigh Woods during which the 'foraging' of members was recorded by a T.V. cameraman. On 25/26 Nov. during the last field meeting of the year members saw the flock of wintering avocets on the Tamar Estuary.

The indoor meetings included three travel talks generously backed up by exciting slides and exhibits. The talks were given by Mr. J. Savory on "East African Wild Life," Mr. D. Hamilton on "Curiosities of Nature in New Zealand," and Dr. B. Heine on "Borneo Journeys." On 25 Mar. Mr. D. A. C. Cullen spoke on conservation and on 9 December Mr. G. Moysey described his career in forestry. Our thanks are due to the many people who have contributed to the year's meetings and we look forward to a steady growth in further activities.

ELAINE HURRELL, *Hon. Secretary.*

ACCOUNT OF THE GENERAL MEETINGS

1966

THE 103rd Annual General Meeting was held on 20 January, when the Officers and Council Members for 1966 were elected with Mr. F. R. Sterne as President. Adverse weather conditions prevented many members—including the newly elected President—from attending. Nevertheless 60 members were present when Professor Macgregor Skene and Mr. T. R. Fry were made Honorary Members in recognition of their work for the Society. The retiring President gave an address entitled "Toad in the Hole and other items of Unnatural History."

On 3 Feb. Dr. G. B. Corbet addressed us on the distribution of mammals throughout the world. Describing the badger in some detail, he also considered many other smaller mammals showing how food and the presence of near relatives helped to limit distribution.

On 3 Mar. Mr. D. Aldridge gave a most enlightening talk on all aspects of the Peak District National Park. It was amply illustrated with colour slides.

On 6 Oct. the winter session opened with a full lecture theatre to hear Mr. Peter Dawson give a talk on "Birds of the Seychelles". One of a party of five from the University of Bristol who had gone to study the islands, he showed how the changing face of the islands affected the bird-life on them.

On 3 Nov. Dr. Ian Linn spoke on "A visit to St. Kilda", where he had studied the distribution and life of the indigenous long-tailed field mice.

On 1 Dec. Mr. Ian Mercer described Field Study Centres in general and then detailed some of the work being carried out at his own Centre at Slapton Ley.

All the general meetings were well supported and the varied subjects chosen for the meetings met with general approval.

GWYNNETH STERNE, *Hon. Secretary.*

GENERAL FIELD MEETINGS

EIGHTEEN field meetings were held during the year including a week-end meeting and a Social Evening. They were generally well supported.

A list of the meetings with dates, places visited, leaders, and some indication of the main objects of interest is given below. A more complete account is kept in the records of the Field Committee.

Jan. 10: Abbotsbury. Chesil Beach and the Fleet, a shingle beach with a freshwater lake behind it; birds and shore life. Mr. D. A. C. Cullen.

Feb. 20: Penarth. A walk along the shore and the old dock area; waders, gulls, fossils in the cliffs, and snails. Mr. H. G. Hockey.

Feb. 26: Social Evening. An illustrated talk on Wales and a film of red squirrels. Mr. J. Eatough.

Mar. 27: Hawkridge reservoir (birds). A walk along the top of the Quantocks from Crowcombe Park Gate to Holford Combe (signs of deer and six stags). Mr. H. G. Hockey and Miss L. E. Hurrell.

Apr. 8: Cleeve Hill and Cheltenham. An open Common with many barrows and earthworks. Mr. H. G. Hockey and Miss L. West.

May 8: New Forest. Highland Water; ornamental drive by Vinny Ridge; river at East Boldre; marsh and pool at Norley Wood; salt marsh at Beaulieu. Birds and plants of a variety of habitats. Mr. D. A. C. Cullen.

May 18: Staverton to Bradford-on-Avon. A walk along the canal bank. Miss A. M. Sampson.

June 5: Porlock marsh; shingle beach; cliff path to Hurlstone Point; Hurlstone wood (partly holm oak); Bossington. Birds, plants and moths. Mr. and Mrs. R. J. Lovell.

June 19: Guiting Power Nature Reserve. Three fishponds and marsh (20 acres) along the Windrush, with a rich marsh and pond flora. Birds, insects, and a badger set were also observed. Miss R. C. Lee and Commander Dudley-Smith.

June 22: A walk from Barton village over Crook Peak to Compton Bishop. Mr. H. G. Hockey.

July 9: South Malverns, Chase End Hill and Hollybush. Geology (pre-Cambrian to Ordovician), birds and plants. Dr. J. W. Cowie and Miss R. C. Lee.

July 12: Cadbury Camp near Tickenham. Plants and evidence of badgers. Miss R. C. Lee.

July 17: Exmoor. River Barle (marsh plants, birds, demoiselles); Anstey Common; Molland village, where a small zoo was visited; Tarr steps (birds, including dippers and a kingfisher). Mr. and Mrs. H. G. Hockey.

Aug. 20: A walk through Cirencester Park and visit to Cirencester Museum. Miss C. Groves.

Sept. 10: Forest of Dean. Lydney Park (an excavated Roman Temple in an Iron Age hill fort); walk from Mile End to Speech House through Wimberry Slade (one-man coal mines) and New Beechenhurst Enclosure; Forest Garden (specimen trees); Devil's Chapel (Roman iron workings). Dr. A. F. Devonshire.

Oct. 8/9: Week-end in Barnstaple Bay area. Saunton Sands; Baggy Point; Braunton Burrows. Sea birds and waders. Mr. and Mrs. R. J. Lovell.

Oct. 23: Westonbirt Arboretum and Silk Wood. Miss R. C. Lee.

Nov. 20: Uphill and Sand Bay, Weston-super-Mare. A comparison of rocks at Uphill formed on an ancient shore and sediments laid down on a modern shore at Sand Bay. Mr. D. Hamilton.

Dec. 4: Chew Valley Lake. A walk round the south side of Blagdon Lake (waterfowl and woodland birds); Stock Wood (fieldfares and redwings). Mr. D. A. C. Cullen.

A. F. DEVONSHIRE, *Hon. Field Secretary.*

ACKNOWLEDGMENT

Thanks are due to the Colston Research Fund Committee of the University of Bristol and to the British Broadcasting Corporation for financial assistance towards the cost of production of this issue of the PROCEEDINGS.

BRISTOL BOTANY IN 1966

By A. J. Willis

IN a year of undistinguished weather conditions plant records have continued to be made in a steady stream although the Bristol area is such a well worked one botanically.

The year was close to the average as regards rainfall, temperature and sunshine, but January was cold and snowy and April dull, wet and cold, with an unusually heavy fall of snow towards the middle of the month. The cold April led to a check in growth after a fairly mild February and March, but the sunny conditions in May (the warmest day of the year was the early date of 9 May, with a maximum of 80°F. at Long Ashton) resulted in average flowering times. Conditions during the summer were cool and rather dry, the year ending with mild weather in December which continued into 1967. Indicative of the very mild winter may be noted, for example, the thick reddish floating mat of the water fern *Azolla filiculoides* conspicuous on the Canal at Claverton in early March 1967.

Field observations made in recent years suggest that some plants which at the beginning of the century were plentiful may now be more restricted in their distribution. The commentary in White's *Flora* indicates, for example, a former greater abundance of the Broomrape *Orobanche minor* and the grass *Parapholis strigosa* than present day studies show. On the other hand, the long continued existence of populations, some small, of certain species in restricted sites is noteworthy. In this connection may be cited *Hornungia petraea* and *Thelypteris oreopteris* listed in this report, *Cyperus fuscus* on Walton Moor, *Geranium phaeum* at Charterhouse and *Dianthus gratianopolitanus* at its locality some distance east of Cheddar. But this year's notes also indicate extended distributions of some plants: *Epipactis palustris* and *Hieracium strumosum* are here recorded for the first time for the most southerly Botanical District (5) of Gloucestershire, and *Poa angustifolia* for a station on Mendip.

The continuing study of the bryophyte flora of N. Somerset by Mrs. J. Appleyard has led to further considerable advances in our knowledge of the local representation of this group. In particular, some half-dozen new vice-county records have been made by her during the year and about a dozen second and third records of bryophytes in v.c. 6; the list of bryophytes on Steep Holm has also been extended. Of special note is the excellent discovery in Glen Frome by Dr. Munro Smith of *Pohlia lutescens*, not previously known in Britain, and the subsequent finds of this moss in two N. Somerset localities by Mrs. Appleyard.

During September a well attended conference of the Botanical Society of the British Isles concerning critical groups of plants was held in the Department of Botany, University of Bristol, for writers of local Floras. Notes on these papers and keys for use in determining taxa of "difficult" groups are published in the *B.S.B.I. Proceedings* (Vol. 6, Pt. 4, 362–89, 1967). The paper-reading meetings were followed by a visit to the Avon Gorge, where Mr. Nethercott, who is now acting as the referee for *Sorbus* in Britain, pointed out several of the taxa for which the site is famous.

Further tributes have been paid to the former author of this report, the late N. Y. Sandwith. His contribution to our knowledge of British plants is well covered in an Obituary in the *Proceedings of the Botanical Society of the British Isles* (Vol. 6, Pt. 4, 418–22, 1967) and his standing as a botanist of international repute in an appreciative Obituary by J. P. M. Brenan in *Taxon* (Vol. XV, No. 7, 245–55, 1966). The latter article contains a life-like photograph.

Names of contributors of several records are abbreviated thus:

J.A., Mrs. J. Appleyard
A.F.D., Dr. A. F. Devonshire
I.W.E., I. W. Evans
G.W.G., G. W. Garlick
I.F.G., Miss I. F. Gravestock
R.M.H., Dr. R. M. Harley
P.J.M.N., P.J.M. Nethercott
R.G.B.R., Capt. R. G. B. Roe, R.N.
D.M.S., Dr. D. Munro Smith
A.J.W., Dr. A. J. Willis

Ranunculus acris L. An abnormal form of Meadow Buttercup, bearing a small flower produced from the centre of another, in a field with proliferated specimens of *Trifolium repens* L., Bleadon Hill, **S.**, *Miss A. Storey*, conf. *A.J.W.*

R. ficaria L. The form, apparently of genetic origin, with dark blotches on the leaves, Downend, **G.**, *D.M.S.*

Raphanus raphanistrum L. A lilac-flowered Wild Radish in wooded part, Cheddar, **S.**., *I.F.G.*, det. *A.J.W.*

Hornungia petraea (L.) Reichb. Leigh Woods, **S.**, *P.J.M.N.*, who reports that although not seen since 1961 on one site where strong vegetation has fully occupied the ground, in another site nearby the Rock Hutchinsia maintains itself in small quantity.

Chenopodium ficifolium Sm. Derelict garden, Stoke Bishop, Bristol, **G.**, *I.F.G.*

Rhamnus catharticus L. A single bush about eight feet high on a crag, Goblin Combe, **S.**, *A.F.D.*

Trifolium striatum L. By track on heathy ground, Goblin Combe, **S.**, *R.M.H.* In the same locality was *Cerastium atrovirens* Bab.

Vicia sepium L. var. *ochroleuca* Bast. The white form of the Bush Vetch, given in old records as subvar. *alba* Rouy, Nempnett Thrubwell, *Miss C. Parker*, and Bleadon Hill, **S.**, *Miss A. Storey*, det. *A.J.W.*

Sorbus torminalis (L.) Crantz. Cheddar Wood, **S.**, *P.J.M.N.*

Sedum forsteranum Sm. Several very robust clumps on old bridge of disused railway station, Uphill, **S.**, *I.F.G.*

Lythrum salicaria L. A white-flowered plant by a rhine, Duckhole, Morton, Thornbury, **G.**, *G.W.G.*

Callitriche platycarpa Kütz. Two good colonies of this Starwort in fruit, Kingston Seymour, **S.**, *Dr. J. P. Savidge*, as well as *C. stagnalis* Scop. and *C. obtusangula* Le Gall in several ditches.

Calystegia pulchra Brummitt & Heywood × *sepium* (L.) R. Br. This pink-flowered hybrid occurred on waste ground, Kingswood, Bristol, **G.**, *D.M.S.*, det. *R. K. Brummitt.*

Linaria repens (L.) Mill. In abundance on churchyard wall, Mells, **S.**, *D. E. Ladhams*, conf. *P. F. Bird* and *A.J.W.*

Veronica scutellata L. In a rhine, with *Achillea ptarmica* L., Weston Moor, Gordano valley, **S.**, *Mr.* and *Mrs. C. H. Cummins.* On adjoining waste ground was *Saponaria officinalis* L.

Orobanche minor Sm. A quantity of plants in abandoned cultivated fields near Cheddar Wood, **S.**, *P.J.M.N.*

Salvia horminoides Pourr. Brean Down, **S.**, *P.J.M.N.*

Bellis perennis L. Specimens of "Hen and Chickens" daisy, in which small stalked capitula arise from the parent capitulum, in field above Charlcombe Bay, near Clevedon, **S.**, *Dr. T. S. Low-Beer*, det. *A.J.W.*

Cirsium arvense (L.) Scop. A form with flat, entire, setose-fringed leaves, waste ground, Moorend, **G.**, *D.M.S. Dr. W. A. Sledge* reports that this form, *C. arvense* var. *integrifolium* Wimm. & Grab. or *C. arvense* var. *setosum* M. Bieb. f. *integrifolium* (Wimm. & Grab.), seems to be very uncommon in this country.

Onopordum acanthium L. On made-up ground on road side, Mays Hill, Coalpit Heath, **G.**, *G.W.G.*

Hieracium strumosum (W. R. Linton) A. Ley. Shortwood and Bury Hill, Winterbourne, **G.**, *D.M.S.*, det. *C. E. Andrews*. A first record for this part of Gloucestershire.

Asparagus officinalis L. ssp. *officinalis*. A single plant, Brean Down, **S.**, *P.J.M.N.*

Epipactis palustris (L.) Crantz. About a dozen flowering spikes in open marshy ground, Shortwood, Pucklechurch, **G.**, *D.M.S.*, conf. *A.J.W.* The record of this freely fruiting orchid provides a substantial extension of its range in Gloucestershire. In the same locality were white-flowered very robust specimens of *Dactylorchis fuchsii* (Druce) Soó, *D.M.S.*

Coeloglossum viride (L.) Hartm. Binegar Bottom, another locality for the Frog Orchid on Mendip, **S.**, *R.G.B.R.*

Dactylorhiza incarnata (L.) Soó × *maculata* (L.) Soó. Several plants of this putative hybrid, new to v.c.6, were found by *Dr. J. T. H. Knight* on the sand dunes at Berrow, **S.**, in the vicinity of one of the probable parents, *D. incarnata*, and also *D. praetermissa* (Druce) Soó, both with very dark red flowers. The other parent, *D. maculata*, is absent from the dunes which are everywhere calcareous, but it occurs in acidic sites not far inland. The leaves of the putative hybrid plants were narrow, slightly hooded and marked with small round spots. The flowers were pale pink, unlike those of any of the other orchids there, the broad lips having definitely recurved margins. Markings on the lip showed a predominance of spots, unlike the normal pattern of *D. incarnata*. The spurs, although variable in thickness, were intermediate between those of a spotted and a marsh orchid, and the bracts showed the angulation characteristic of *D. incarnata*. Also present on the Berrow dunes was a single fine plant of *Dactylorhiza praetermissa* (L.) Soó × *D. fuchsii* (Druce) Soó, *Dr. J. T. H. Knight.*

Wolffia arrhiza (L.) Hork. ex Wimm. In ditches, with *Lemna polyrhiza* L., Kingston Seymour, **S.**, *Dr. J. P. Savidge.*

Typha latifolia L. Pond in Stokeleigh Forest near Abbots Leigh, **S.**, *P.J.M.N.*

Scirpus lacustris L. Two small patches, together with a well-developed colony of *S. maritimus* L., on the right bank of the Avon below the Cook's Folly area, **G.**, *P.J.M.N.*

Carex pallescens L. Long Wood, Cheddar, **S.**, *P.J.M.N.*

C. disticha Huds. Marshy field near R. Chew, Pensford, **S.**, *R.G.B.R.*

C. pulicaris L. Wavering Down, **S.**, *P.J.M.N.*

Poa angustifolia L. Edge of field adjoining Cheddar Wood, **S.**, *Miss B. E. Dixon*, conf. *D. M. Barling*, *R.M.H.* and *A.J.W.* The date, 27 April 1965, emphasizes the early panicle emergence, typical of this plant, whose known distribution is now extended to the carboniferous limestone of the Mendips.

Bromus thominii Hardouin. Grassy area beneath trees, Clifton, Bristol, **G.**, *Miss B. E. Dixon*, det. *A.J.W.*, conf. *R.M.H.*

Agropyron caninum (L.) Beauv. Cheddar Cliffs, **S.**, *P.J.M.N.*

Parapholis strigosa (Dumort.) C. E. Hubbard. Sea Mills, **G.** *P.J.M.N.*

Thelypteris oreopteris (Ehrh.) Slosson. This fern, also known as *T. limbosperma* (All.) H. P. Fuchs, is still in plenty at Ellick, near Blagdon, as recorded in White's *Flora*, **S.**, *P.J.M.N.*

Polypodium australe Fée. Leigh Woods, **S.**, *P.J.M.N.*, conf. *A.J.W.*; also near Clifton Suspension Bridge, **G.**, *Mrs. M. Briggs* and *Mrs. B. H. S. Russell*, a first record for v.c. 34.

ALIENS. *Sisymbrium altissimum* L. Growing with *Agrostemma githago* L., Old Market, Bristol, **G.**, *I.W.E.*

Sagina subulata (Sw.) C. Presl. A garden escape at Downend, **G.**, *D.M.S.* Named as *subulata* by the late *Dr. F. R. Elliston Wright*, but with decumbent rooting stems, almost glabrous leaves, short pedicels, and very few glandular hairs on the pedicel and calyx; although the plant is fertile, it may be *procumbens* × *subulata* or a derivative of this hybrid in the opinion of *Prof. A. R. Clapham.*

Impatiens glandulifera Royle. White-flowered plants, Frenchay, **G.**, *D.M.S.*

Rubus phoenicolasius Maxim. A single bush of the Japanese Wineberry adjoining track, Kingsweston Down, **G.**, and two bushes near a path, Goblin Combe, **S.**, *A.F.D.*

Coriandrum sativum L. In old quarry, Kingswood, **G.**, now used for tipping; also present were *Silybum marianum* (L.) Gaertn., *Camelina sativa* (L.) Crantz, *Linum usitatissimum* L. (abundant, some with white flowers), *Amaranthus retroflexus* L., *Eruca sativa* Mill. and *Fagopyrum esculentum* Moench, *D.M.S.*

Bupleurum lancifolium Hornem. A large specimen of this Umbellifer (also known as *B. subovatum* and *B. protractum*) growing as a weed in rich garden soil at Tormarton, **G.**, was brought to the City Museum by *C. H. Barnes*, det. *A.J.W.*

Sicyos angulata L. Growing as a weed, this Cucurbit from America, known as 'Nimble Kate' and 'One-seeded Bur Cucumber', covered a wide area in a garden, Wrington, **S.**, *W. G. Sims*, det. *Dr. T. E. T. Bond*, comm. *G. E. Clothier*.

Polygonum baldschuanicum Regel. Established, with *Buddleja davidii* Franch., at Sand Point, **S.**, *P.J.M.N.;* also well established as a garden escape in Coombe Dingle, Bristol, **G.**, *A.J.W.*, together with *P. cuspidatum* Sieb. & Zucc.

Buddleja davidii Franch. var. *nanhoensis* (Chitt.) Rehder. This narrow-leaved form was established on wall, University of Bristol, **G**., *I.W.E.*, det. *A.J.W.*

Vinca major L. On railway embankment, Sea Mills, **G.**, *P.J.M.N.*

Borago officinalis L. Road side, Iron Acton, **G.**, *D.M.S.*

Datura stramonium L. In garden, Brislington, Bristol, **S**., *Rev. W. H. O. Moss.*

Lilium martagon L. Whatley Bottom, near Frome, **S.**, *R.G.B.R.*

Bromus tectorum L. Plentiful on wall, Weston-in-Gordano, **S.**, *R.M.H.*

BRYOPHYTES. Sphagnum cuspidatum Ehrh. Walton Heath (1966) and Westhay Moor (1967), **S.**, *J.A.* These records from the peat moors are the first for v.c.6 for which voucher specimens exist.

S. fimbriatum Wils. Shapwick Heath and Westhay Moor, **S.**, *J.A.* The only other record is for Priddy.

Polytrichum alpestre Hoppe. In 1959, in bog, Priddy Pool, **S.**, *J.A.*, a second record for v.c.6.

Fissidens minutulus Sull. var. *tenuifolius* (Boul.) Norkett. Chelynch Wood, near Shepton Mallet, **S.**, *J.A.*, conf. *A. J. E. Smith.* This variety has been previously recorded only in Leigh Woods in v.c.6.

Archidium alternifolium (Hedw.) Mitt. Bare ground at bottom of slope near stream, West Horrington, **S.**, *J.A.*, an interesting confirmation of the occurrence of this moss in v.c.6. The first record was made by W. W. Stoddart in 1874, but W. Watson in *The Mosses of Somerset*, 1912, regarded confirmation desirable.

Dicranella rufescens (With.) Schimp. Hunstrete, Woollard and Black Rock Valley, Cheddar, **S.**, *J.A.*, a first record for v.c. 6.

Dicranum montanum Hedw. Abundant in Paradise Bottom, Leigh Woods, **S.**, *J.A.*, *P.J.M.N.* and *A.J.W.*

Campylopus introflexus (Hedw.) Brid. On cinders by disused railway line, Kilmersdon, **S.**, *J.A.*, an extension of the range of this moss, known hitherto only on 'heaths'.

Tortula subulata Hedw. var. *graeffii* Warnst. Brean Down, **S.**, *J.A.* This locality is its most southerly British station.

Pterygoneurum ovatum (Hedw.) Dix. Steep Holm and on cliff top, Charlcombe Bay, north of Clevedon, **S.**, *J.A.*

Pottia heimii (Hedw.) Fürnr. Walton Bay and Huntspill, **S.**, *J.A.*

P. starkeana (Hedw.) C. Müll. Wall top, Rowberrow, and Worlebury, **S.**, *J.A.;* bordering the scree in a south-facing locality in the Gully, Avon Gorge, **G.**, *D.M.S.*, conf. *F. A. Sowter.* The latter gathering, made in 1962, confirms its occurrence in the Avon Gorge, noted in H. H. Knight's *The Mosses of Gloucestershire*, 1914. Also in the Gully is *Weissia crispata* (Nees & Hornsch.) Jur., *D.M.S.*, det. *E. C. Wallace*, and *W. microstoma* (Hedw.) C. Müll., *D.M.S.*, det. *F. A. Sowter.*

P. bryoides (Dicks.) Mitt. On sandstone between Norton St. Philip and Hinton Charterhouse, **S.**, *J.A.*

Barbula hornschuchiana Schultz. On wall of river bank, Oldbury Court, Glen Frome, **G.**, *D.M.S.*, det. *F. A. Sowter.*

Gymnostomum aeruginosum Sm. In 1964, rocks near the lead mines, Charterhouse, **S.**, *J.A.*

Tortella flavovirens (Bruch) Broth. On low cliffs near Clevedon, **S.**, *J.A.* Its only other N. Somerset station is Burnham.

T. flavovirens (Bruch) Broth. var. *glareicola* (Christens.) Crundw. & Nyh. Raised bank by estuary of R. Parrett near Huntspill, **S.**, *J.A.*, conf. *A. C. Crundwell;* new to v.c.6.

Leptodontium flexifolium (Sm.) Hampe. Wood near Compton Martin, and plentiful among heather, Priddy Pool, **S.**, *J.A.* This moss is known also in Brockley Combe.

Grimmia trichophylla Grev. Quarry, Walton-in-Gordano; Dulcote Hill, Wells; and Downhead, Shepton Mallet, **S.**, *J.A.* These are the first authenticated records for v.c.6.

Pohlia annotina (Hedw.) Loeske. Pen Hill, near Wells, **S.**, *J.A.*

P. lutescens (Limpr.) Möll. This moss, new to Britain, was found by *D.M.S.* on 5 December 1963 on soil covering sandstone rock near the path by the R. Frome, Oldbury Park, Bristol, **G.**, and will be the subject of a paper by Dr. E. V. Watson in the *Transactions of the British Bryological Society.*
Publication of this record was not made previously in the hope that capsules might be produced, and the determination made more certain, but so far only female plants have been seen. The moss has been found on various occasions since 1963 in its Glen Frome locality by *Mrs. J. A. Paton, J.A., R.M.H.* and *A.J.W.* In 1966, this moss was discovered in two Somerset localities by *J.A.*: during August in a muddy ride in a pine plantation near Priddy; and in October on a vertical almost bare bank near to a disused reservoir near Portbury.

Bryum intermedium (Brid.) Bland. On wall by towpath, Avon Gorge, **S.**, *J.A.*, the second record for the Bristol district.

Mnium seligeri (Lindb.) Limpr. Margin of pool, Charterhouse, and Eaker Hill Wood, near Chewton Mendip, **S.**, *J.A.*

Bartramia pomiformis Hedw. Old quarries near Downend, Shepton Mallet, **S.**, 1959, *A.J.W.*, and also 1966, *J.A.*

Aulacomnium androgynum (Hedw.) Schwaegr. Stock Hill Plantation, near Priddy; wood near Leigh-on-Mendip, **S.**, *J.A.* Previous records are all for the peat heaths.

Breutelia chrysocoma (Hedw.) Lindb. Adjoining short limestone heath by Iron Age Fort, Dolebury Warren, **S.**, *Dr. M. H. Martin.* On lower ground in a shaded spot in the same locality was *Rhodobryum roseum* (Hedw.) Limpr.

Zygodon viridissimus (Dicks.) R. Br. var. *vulgaris* Malta. Mells Park, **S.**, *J.A.*, a second record for v.c.6.

Thuidium philibertii Limpr. Stoke-St.-Michael, near Shepton Mallet; Cleaves Wood, Wellow, **S.**, *J.A.* In the latter locality was also *Entodon concinnus* (De Not.) Paris.

Scorpidium scorpioides (Hedw.) Limpr. Boggy field east of Tyning's Farm, near Rowberrow, **S.**, *J.A.*, a second record for v.c.6. In the same locality was *Drepanocladus exannulatus* (B., S. & G.) Warnst. var. *exannulatus*.

Brachythecium salebrosum (Web. & Mohr.) B., S. & G. On fallen branches by Emborough Pool, **S.**, *J.A.*

B. mildeanum (Schimp.) Milde. Clearing in wood, near Winford; also on edge of stone bridge over ditch, with fruit, Sharpham, **S.**, *J.A.* The second and third records for the Bristol district.

Eurhynchium swartzii (Turn.) Curn. var. *rigidum* (Boul.) Dix. Dulcote Hill, Wells, **S.**, *J.A.*

Orthothecium intricatum (Hartm.) B., S. & G. The interesting record of Rev. C. H. Binstead, 1887, for near Wells (wood near Dinder), **S.**, is confirmed by *J.A.* and *A. R. Perry* who have examined a herbarium specimen at Oxford.

Plagiothecium latebricola B., S. & G. On stumps of Chestnut, Paradise Bottom, Leigh Woods, **S.**, *J.A.*, *P.J.M.N.* and *A.J.W.*

Anthoceros husnotii Steph. Westhay Moor, **S.**, *J.A.*, a second record for v.c.6.

Pellia neesiana (Gottsche) Limpr. Damp gully in wood, Bathford, **S.**, *J.A.*

Ptilidium ciliare (L.) Hampe. On stones of viaduct, amongst mosses e.g. *Ptychomitrium polyphyllum* (Sw.) Fürnr., *Rhacomitrium lanuginosum* (Hedw.) Brid., Winterbourne Down, **G.**, *D.M.S.*

Calypogeia muellerana (Schiffn.) K. Müll. Clevedon Court Wood, and Ashcott Heath, **S.**, *J.A.*, the second and third records for v.c.6.

Lophozia ventricosa (Dicks.) Dum. Bank in Clevedon Court Wood, **S.**, *J.A.*

Tritomaria quinquedentata (Huds.) Buch. Amongst mosses and grasses on fairly rocky ground on north slope of Brean Down, **S.**, *J.A.* A second record for N. Somerset.

Mylia anomala (Hook.) Gray. Westhay Moor, **S.**, *J.A.* The only previously recorded site in v.c.6 for this hepatic is Meare, not far from the present locality.

Diplophyllum obtusifolium (Hook.) Dum. Loamy bank, eastern edge of Rowberrow Warren, **S.**, *J.A.* A first record for v.c.6.

The following bryophytes were recorded (*J.A.*) on a B.N.S. visit to Steep Holm in May 1966 (nomenclature follows that of the

British Bryological Society Census Catalogues of British Mosses, 1963, and of Hepatics, 1965):

*Amblystegium serpens**
Barbula convoluta
*B. fallax**
*B. unguiculata**
*B. vinealis**
*Brachythecium rutabulum**
*Bryum argenteum**
*B. bicolor**
*B. capillare**
B. donianum
Camptothecium sericeum
*Encalypta streptocarpa**
*Funaria fascicularis**
*F. hygrometrica**
*Grimmia apocarpa**
*Mnium affine**
*Orthotrichum diaphanum**
*Pterygoneurum ovatum**
Rhynchostegiella tenella
Scorpiurium circinatum
Tortula intermedia
*T. muralis**

Lejeunea lamacerina var. *azorica**
*Lophocolea heterophylla**
Lunularia cruciata
Metzgeria furcata
Porella platyphylla

Most of the bryophytes reported in *A Survey of Steep Holm* by M. Skene (these PROCEEDINGS, Vol. VIII, Part IV, for 1938) were seen again, but a considerable extension to the list was made.

The following fungi were also found on Steep Holm (*Dr. C. E. D. Smith;* determination of the first three listed was confirmed by *Professor L. E. Hawker*):

*Erysiphe polygoni** on *Plantago coronopus*
*Plasmopara nivea** on *Smyrnium olusatrum*
*Peronospora dipsaci** on *Dipsacus fullonum*
Puccinia smyrnii on *Smyrnium olusatrum*
*Stigmatea robertiani** on *Geranium robertianum*
*Auricularia auricula-judae** on *Sambucus nigra*

New records are indicated by *

I am grateful to Mr. G. E. Clothier for information concerning the weather and to Mrs. J. Appleyard and Mr. P. J. M. Nethercott for help in compiling these records.

BRISTOL BIRD REPORT
1966

Compiled by the Editorial Committee of the B.N.S. Ornithological Section

P. J. Chadwick H. H. Davis
H. R. Hammacott G. Sweet
S. M. Taylor

OWING to the high cost of printing, most of the entries in the systematic list have to be summaries; but these are based on a careful analysis of all the records received and comparisons with previous years, so it is hoped that they are at least as useful as a list of the raw data. The record cards themselves are, as usual, filed; from time to time they will be used in making detailed reviews of particular groups, and meanwhile can be made available to serious researchers.

For many of the commonest species, so little information is received that definitive statements cannot be made; we prefer not to rely on subjective impressions, which can be misleading, and so these species are omitted from the body of the list. This problem faces all Bird Report editors; the solution may lie in the work of the British Trust for Ornithology's Common Birds Census. The possibility of special local censuses in sample habitats is being actively considered, and meanwhile the best available statement of status for these species remains *A Revised List of the Birds of the Bristol District* (*Proc. B.N.S.*, 1947, pp. 225–268).

Some observers' records were not available for the compilation of this report, so for certain species further details relating to the Bristol District may be found in the Somerset County Bird Report.

A feature of 1966 was the very early first arrival of some summer migrants. Chiffchaffs were widely scattered over the area in the first few days of March, and a Wheatear was seen on the ninth. The first Swallows appeared in mid-March, but the first Ring Ouzel came two weeks later. After a lull during which there was a small wreck of Kittiwakes, the main migrant arrival began in early April. Somewhat surprisingly, a return of wintry conditions—cold E. winds with rain and snow—in the week ending on the 16th brought a heavy fall of migrants. Among them were Marsh Harrier, Osprey, Kentish Plover and Little Ringed Plover. The first Swifts were reported a few days later.

There was a marked passage of Black Terns (part of a nationwide movement) at the end of May, and during early June three continental species—Spoonbill, Hoopoe and Golden Oriole—were reported. Following the widespread irruption of Crossbills which started on June 12, the first birds reached this area on the 30th, and the species was afterwards widely reported up to the end of the year. The Pied-billed Grebe re-appeared towards the end of July at Chew Valley res., where an Aquatic Warbler and a Bee-eater were seen in mid-August and a White-winged Black Tern with Black Terns towards the end of the month. Feeding flocks of Redwings appeared to be smaller than usual in autumn, though no inference about total numbers can be made; they were apparently plentiful in the east of the country, and possibly fewer moved westwards owing to the mild winter.

Information on breeding ducks is incomplete, but the Ruddy Duck at Chew seem not to have bred, while on the coast the Shelduck population continued to decline (in contrast to the pattern over the rest of the British Isles). A review of members' work on the breeding season status of the Kestrel, published in this issue, shows a satisfactory state of affairs. The Collared Dove steadily multiplies and extends its range in the district. On the other hand, the Barn Owl is extremely scarce.

The Song Thrush, Robin and Wren, severely depleted during the winters of 1961–2 and 1962–3, have now apparently regained their former status. For many species, however, there is a striking lack of data on breeding—data essential for assessing the effects of environmental changes and also for making the case for conservation. Ideally, such information is best gathered through studies of the kind for which the Common Bird Census is the model, and through nest-recording. Unfortunately, there seems to have been a decline of interest and skill in nest-finding, perhaps following the great increase in bird-ringing brought about by the advent of the mist-net. We urge members to do all they can to contribute to the B.T.O.'s Nest Recording Scheme.

The problem of identifying races and subspecies in the field requires comment. Several autumn records of White Wagtails were received, without details. At this time of year, considerable skill and favourable conditions are needed to distinguish them from Pied Wagtails, and full details should be given. The Scandinavian race of the Lesser Black-backed Gull is a similar case. In our view, strengthened by consultations with Dr. W. R. P. Bourne and Mr. R. A. O. Hickling, distinction between the races of *Larus fuscus* calls for observations made under good conditions and preferably from more than one position. General visibility, the direction of the incident light and the nature of the background are all relevant and information about these, and also any comparisons with nearby birds of the other race, should be given. The remarkable way in which the observing conditions can affect apparent colouring in this and other cases is often not appreciated, and is a subject well worth study.

We thank all who have contributed their records; these are equally valuable and equally appreciated whether or not they are individually cited.

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Headings **G.** and **S.** refer to South Gloucestershire and North Somerset and cover the areas as defined in *Proc. B.N.S.*, 1960, p. 114.

Black-throated Diver *Gavia arctica*

S. One, Blagdon res., Mar. 4 (W.L.R.)—seventh record for area, cf. *Proc. B.N.S.*, 1964, pp. 34, 35.

Great Northern Diver *Gavia immer*

S. Two, Cheddar res., Nov. 22 to end of year (S.H.G.B., H.W.N. *et al.*) with three, Dec. 14 (N.J.C.), 31 (R.J.P.). Single birds, Chew Valley res., Dec. 27 (T.R.J., S.J.M.), 30 (R.S.H.).

RED-THROATED DIVER *Gavia stellata*

S. Single birds, Chew Valley res., Feb. 26 (B.R.); Cheddar res., Feb. 26, Mar. 1 (B.R. *et al.*).

GREAT CRESTED GREBE *Podiceps cristatus*

G. Pair reared two broods, Tortworth Lake (J.H.).

S. Max. winter res. counts: 64, Cheddar, Jan. 21 (B.R.) and 20, Chew Valley, Feb. 3 (E.M.P.). Breeding reported from Blagdon (9 nests), Chew Valley (51 young), Orchardleigh lake (2 nests) and Litton res. (pair with 3 young): nil returns from 12 other sites (C.B., R.M.C., B.K., D.E.L., K.E.L.S. *et al.*). Exceptionally high numbers at resrs. in autumn—total of *c.* 250 (230, Chew Valley), end Sept., mid-Nov. (B.K., J.A.McG. *et al.*).

RED-NECKED GREBE *Podiceps griseigena*

S. One, Chew Valley res., Mar 27 (A.P.R.). Only nine or ten previous records—Eds.

SLAVONIAN GREBE *Podiceps auritus*

S. One, Cheddar res., Dec. 1965, stayed to Apr. 8 when joined by second bird (R.A., G.G.C., R.M.C. *et al.*). One, Chew Valley res., Mar. 13–Apr. 3 (P.J.C., P.L.G. *et al.*) and two, Apr. 13–17 (P.C., W.J.S. *et al.*). Single birds, Cheddar res., Nov. 5, 6 (S.J.M. *et al.*); Blagdon res., Nov. 12, Dec. 24 (R.A., R.M.C.); and Barrow Gurney resrs., Dec. 3–18 (H.R.H.L. *et al.*).

BLACK-NECKED GREBE *Podiceps nigricollis*

S. One, Cheddar res., Feb. 3 (W.L.R.). One, Chew Valley res., Aug. 24–Nov. 12 (T.A.G., R.H., A.M.R. *et al.*); Blagdon res., Nov. 13 (S.I.B.) and two on 19th (J.E.A.).

PIED-BILLED GREBE *Podilymbus podiceps*

S. One reported, Chew Valley res., mid-May but confirmatory details not received; present and seen by many observers, July 21–Nov. 2.

LITTLE GREBE *Podiceps ruficollis*

S. Present, Blagdon and Chew Valley resrs., in breeding season but young seen only at latter where three pairs bred (R.J.P. *et al.*). Usual autumn counts of up to 50–60, Oct. (G.L.B., P.J.C. *et al.*).

STORM PETREL *Hydrobates pelagicus*

S. One close inshore after gales, R. Kenn–Yeo Estuary coast, Dec. 3 (G.B., K.J.H.).

MANX SHEARWATER *Procellaria puffinus*

G. Three found inland around Yate and Gloucester, taken to W.T. where released on river, mid-Sept. (M.A.O.).

S. One attempting to roost on road, 8.30 p.m., Brean, Sept. 6 (T.R.J.W.).

FULMAR *Fulmarus glacialis*

S. One site-prospecting, Brean Down, Mar. 31 (R.A.).

GANNET *Sula bassana*

S. Adult female found dead, Clevedon, Mar. 1 (M.H.R.). Single ads., found dead, Sand Bay, Sept. 16, 18 (R.A.) and one in flight off Steep Holm on 28th (Res. Stn.).

SHAG *Phalacrocorax aristotelis*

S. Ailing juv., Cheddar res., 12.9.65, found dead on 13th, had been ringed, Annet, Scilly, 8.7.65; another juv., 18 and 27.9.65 (J.A.McG., B.R., B.E.S.). One flying W., Brean Down, Apr. 30 (T.R.J.W.). Juvenile, Cheddar res., Aug.23–Sept. 18 (R.M.C., J.A.McG., B.R.).

HERON *Ardea cinerea*

S. Breeding reported, Cleeve Wood (23 nests), Newton Park (5 nests) and Uphill Grange, Weston-s-Mare (3 nests)—Brockley heronry now deserted (D.A.C., D.J.P., S.R.). Regular at reservoirs —max. counts: 34, Chew Valley, Feb. 3, and 30, Oct. 30 (E.M.P., D.W. *et al.*).

BITTERN *Botaurus stellaris*

S. Single birds, Chew Valley res., Jan. 8 (R.A.), 23 (K.J.H.) and Nov. 20 (D.W.).

SPOONBILL *Platalea leucorodia*

G. Adult present, W.T. enclosures, New Grounds, June 12–14 (L.P.A.).

MALLARD *Anas platyrhynchos*

G. No winter counts, New Grounds, but autumn totals of 1,480, Sept. 16; 1,850, Oct. 17; and 1,700, Dec. 19 (M.A.O.). Total of 70, Eastville and Stapleton Parks, Bristol, Jan. 7 (P.A.R.); 60+ at former, July 24, and brood of 7 ducklings (R.H.P.).

S. Counts from resrs. and selected parts of coast indicate peaks mid-Jan. and mid-Sept., with numbers about 5% lower in Nov. and Dec. Breeding reported from Blagdon, Chew Valley, Bath, Hunstrete, Stoke Moor, Kenn Moor, Wick St. Lawrence and Sand Bay.

TEAL *Anas crecca*

G. No winter counts. 250, New Grounds, Sept. 16; 600, Oct. 17; and 450, Dec. 19 (M.A.O.).

S. Another poor year—max. of 550 in area, Jan. 16 and 620, Dec. 18 (B.K., J.A.McG., R.J.P. *et al.*).

GARGANEY *Anas querquedula*

G. Female, New Grounds, May 25 and male on 31st (M.A.O.).

S. Present, Chew Valley res., Apr. 2–Oct. 1; one or two pairs bred (R.S.H., D.H.P. *et al.*). One, Blagdon res., Sept. 11 (P.J.C.), 18 (R.J.P.).

GADWALL *Anas strepera*

G. Resident population of 20–30, W.T. enclosures, New Grounds; 38 there, Sept. 19 and 44, Oct. 19 (M.A.O.).

S. Up to 14, Emborough Pond, Jan.–Feb. (B.R.). Pair, Blagdon res., Jan. 16, Apr. 3, May 27 (R.A. *et al.*). Gradual increase, Chew Valley res., to 23 pairs, Apr. 3 (B.R. *et al.*); at least eight broods seen (B.K., R.J.P., W.J.S. *et al.*). Approx. 30–40 at resrs., end Sept.–early Oct. (J.E.A., J.A.McG. *et al.*).

WIGEON *Anas penelope*

G. and **S.** 2,150 in area, mid-Jan.—cf. 2,700, 1965; slow autumn rise from 350, mid-Oct., to 1,660, mid-Dec. and *c.* 1,800 by end of year—cf. 2,200, 1965 (A.F.A., R.A., D.I.M.W. *et al.*).

PINTAIL *Anas acuta*

G. and **S.** Numbers lower than last year. Max. of 245, mid-Jan. and 170, mid-Dec., majority as usual on estuary or in W.T. enclosures, New Grounds (R.S.H., M.A.O., T.B.S., D.I.M.W. *et al.*).

SHOVELER *Spatula clypeata*

G. 115, New Grounds, Jan. 11 (D.I.M.W.).

S. Majority, Chew Valley res.: *c.* 75, early Jan. (B.K.) and 60, mid-Mar. (P.J.C.); 25, Oct.–Nov. (W.L.R. *et al.*) increasing to 85, mid-Dec. (B.K., W.U. *et al.*) and 130 on 30th—feeding in "remarkably dense groups" (R.S.H.). Max. of 47, Blagdon res., Oct. 16 (P.J.C.)—all other records of less than 25 birds (R.A., R.J.P. *et al.*).

RED-CRESTED POCHARD *Netta rufina*

S. Female, Chew Valley res., Mar. 3 and pair, Apr. 2 (A.P.R.). Imm. ♂, Cheddar res., Nov. 19, 20 (P.L.G. *et al.*).

SCAUP *Aythya marila*

S. Single ♂♂, occasionally two, Barrow Gurney, Blagdon, Cheddar and Chew Valley resrs., Jan.–Apr., Aug.–Dec. (H.W.N., D.J.P. *et al.*). Parties of 12 (4 ♂♂, 1 imm. ♂), Chew Valley, Mar. 13 (S.J.M., M.A.W. *et al.*), eight ♀♀ or imms., Nov. 10 and seven on 16th (B.R. *et al.*). [Full details are requested for all records of this species; the pattern of colour on the bill should receive particular attention—cf. *Wildfowl Trust Report*, 1964–5, pp. 49–65—Eds.].

Aythya hybrid

S. One, Barrow Gurney resrs., Jan. 13 and another, Nov. 1, 12 (B.R.)—both with reddish-brown heads—and third with green sheen on head, Dec. 10 (R.J.P.). Bill colour pattern not described—cf. article mentioned above.

TUFTED DUCK *Aythya fuligula*

S. Winter totals, all resrs.: 275, mid-Jan.; *c.* 250, mid-Feb.–mid-Mar. (R.A., P.J.C., R.J.P. *et al.*). Spring passage again noted, Chew Valley res., end Apr.–early May with 300 present, May 1 (D.J.P.). Breeding reported, Blagdon (T.B.S.), Chew Valley (R.A., G.L.B.) and Orchardleigh Lake (R.M.C.). Autumn counts reached peak of 365, Nov. 12, 13 (K.A.H., B.K., J.F.R. *et al.*).

POCHARD *Aythya ferina*

S. Considerable movements between resrs. due to disturbances but total population of *c.* 750, mid-Jan. and 315, mid-Feb. (C.C.D., D.E.L., W.J.S. *et al.*). Autumn arrivals, end Aug.–early Sept. (P.L.G.); up to 1,250 or more, mid-Oct. (A.F.A.); 1,565, Nov. 12 (R.A., J.A.McG. *et al.*) and possibly over 2,000, Dec. 18 when 1,270 present, Chew Valley res. (P.J.C.). At least three pairs nested (but two robbed), Chew Valley res. (A.E.B., B.K.).

GOLDENEYE *Bucephala clangula*

G. Male on Estuary, New Grounds, Nov. 17 (L.P.A.).

S. Reported from all resrs. except Litton, Jan. to end Apr. (5, Blagdon, Apr. 30—R.A.) with peak of 60, early Mar. (2, Barrow Gurney; 17, Blagdon; 3, Cheddar; 38, Chew Valley). Autumn arrivals from Oct. 15 and *c.* 20-25 in area to end of year (G.L.B., R.S.H., B.R., W.U. *et al.*).

LONG-TAILED DUCK *Clangula hyemalis*

S. Female or imm. off Brean Down, Jan. 23 (R.A.), and another, Barrow Gurney resrs., Nov. 1 to end of year (G.W.B., T.C., T.R.J., A.D.L., N.T.L. *et al.*).

COMMON SCOTER *Melanitta nigra*

G. Male on Estuary, New Grounds, Aug. 19 (L.P.A.).

S. Three (males), Weston Bay, Mar. 13 (R.A.) and one on 19th (R.D.O.); five, same place, Apr. 22 (T.R.J.W.) and two males on 24th (R.M.C.). Pair, Chew Valley res., Mar. 27 (B.R.) and single males, Cheddar res., Apr. 21 (N.J.C., J.A.McG.), 26 (N.J.C.). Single birds, Weston Bay, Nov. 12, and on coast, Clevedon—Yeo Estuary, Dec. 3 (K.J.H.).

EIDER *Somateria mollissima*

S. Imm. male, Weston Bay, Feb. 20–Mar. 19 (R.A., A.C.L., M.P. *et al.*) and two birds, Sand Bay, July 27 (W.L.R.) to Sept. 18 (R.A., H.R.H.L.).

GOOSANDER *Mergus merganser*

S. Chew Valley res.: one or two, Jan. 2–Mar. 13, (C.C.D., A.M.R. *et al.*); one, end Nov. (K.J.H.); two, Dec. 14–17 and five, Dec. 23–31 (N.J.C., R.S.H., T.R.J. *et al.*). Two, Cheddar res., Jan. 13–16 (R.A., J.A.McG., B.R.) and three, Jan. 21 (B.R.), Feb. 11 (H.R.H.L.).

SMEW *Mergus albellus*

S. Up to three (1♂), Chew Valley res., Jan. 1–Mar. 5 (J.F.B., R.H., D.J.P. *et al.*) but two ♂♂, Feb. 19 (C.A.P.): last seen—two, Mar. 17 (R.S.H.). Two, Blagdon res., Feb. 20 (T.B.S.). Pair, Chew Valley res., Dec. 23–31 (J.J. *et al.*) and two ♂♂ on 30th (R.S.H.).

NORTH AMERICAN RUDDY DUCK *Oxyura jamaicensis*

S. No breeding records. Up to 13, Chew Valley res., Jan. (R.S.H., D.W.) and seven still present, Apr. 13 (D.J.P.) but only three, Apr. 30 (R.M.C.), May 20, and pair, June 12 (R.A.); one, Sept.–Nov. (M.L.D. *et al.*); six, Dec. 18 (P.J.C.) and eight on 28th (B.R.). One, Cheddar res., Jan. 16 (J.A.McG.), 21 (B.R.). Two, Blagdon res., Nov. 13 (R.J.P.) and two pairs, Dec. 24 (R.A.).

SHELDUCK *Tadorna tadorna*

G. and **S.** No precise data on breeding success, R. Avon to Weston-s-Mare, but evidence of further decline—cf. *Proc. B.N.S.*, 1964, p. 39 and 1965, p. 146; several late broods again noted (R.A., H.R.H., T.B.S , S.M.T.). None seen, Pill, where regular 5 years ago (J.F.B.). Two pairs bred, Chew Valley res. (many observers).

GREYLAG GOOSE *Anser anser*

G. Two feeding on saltings with Whitefronts, New Grounds, Jan. 7 and one, Feb. 23; possibly wild birds but many are kept full-winged and unringed in W.T. enclosures (M.A.O.).

WHITE-FRONTED GOOSE *Anser albifrons*

G. New Grounds: 1,800 at end 1965 had increased to 3,000, Jan. 22; to 4,700, Feb. 6, and to highest known total of 5,500 on 9th. At least 4,000 still present, mid-Feb., but only 350 on Mar. 8; last seen (two), Mar. 10. Autumn: first birds—three, Sept. 3; 94 by late Oct., then slow rise to 1,300 on Dec. 30 (W.T.).

S. Fourteen flying N., Sand Point, Jan. 9 (D.J.P.); 29, also to N., Weston-s-Mare, on 18th (P.C.). Parties of 40 and 60 heading S. over Long Ashton, Jan. 24 (J.E.A.) and 28 (G.E.C.).

LESSER WHITE-FRONTED GOOSE *Anser erythropus*

G. Two ads., New Grounds, Feb. 6, 13, one of which seen again on 20th; a third ad. reported on 27th (W.T., D.I.M.W.). Immature, Feb. 27 (D.I.M.W.) and another imm., same date (J.A.B.).

BEAN GOOSE *Anser fabalis*

G. One, of Western race, *A. f. fabalis*, among Whitefronts, New Grounds, Feb. 6 (M.A.O.); still there on 20th (R.M.C., W.T.).

PINK-FOOTED GOOSE *Anser brachyrhynchus*

G. New Grounds: only records—one, Jan. 7, and second, Feb. 6, then continued sightings to end of month (M.A.O.); one, probably different bird, Mar. 5 (D.I.M.W.).

DARK-BREASTED BRENT GOOSE *Branta bernicla bernicla*

G. Party of seven ads. on saltings, New Grounds, Jan. 26; not seen again, but one present, Feb. 2 (M.A.O.). One on saltings, Chittening Warth, and afterwards on water nr. Severn Beach, Mar. 13 (K.J.H.).

S. One on mud-flats, Sand Bay, Feb. 6 (R.A.).

BARNACLE GOOSE *Branta leucopsis*

G. Juv. with White-fronts, New Grounds, early Feb. to Mar. 6 or later (R.M.C., M.L.D., M.A.O., P.A.R.).

CANADA GOOSE *Branta canadensis*

G. Birds maintained at Frampton Gravel Pits continue to make frequent visits to the W.T. enclosures and sometimes to adjoining saltings (M.A.O.).

S. Three flying up R. Axe at high tide, Apr. 24 (R.A.).

WHOOPER SWAN *Cygnus cygnus*

S. Herd of 24 (8 imm.), Stoke Moor, Nov. 13 (C.Lo.).

BEWICK'S SWAN *Cygnus columbianus*

G. New Grounds: *c.* 20, early Jan., rising to 85 on 18th, and 110–120, daily, Jan. 20–Mar. 10, with max. of 125, Feb. 14; all gone by Mar. 24; 147 individuals identified (by bill pattern) during winter. Autumn arrivals—6, Oct. 26 and 27 on 30th; rapid rise to 154, Nov. 20; 130–140 present, Nov. 30–Dec. 23 (but *c.* 193, Dec. 19 (R.A.)); 229 identified by Dec. 31 (P.S. *et al.*).

S. Only small numbers at resrs.: max. of 45, Chew Valley, Jan. 30 (J.E.A. *et al.*); last noted—one, Apr. 26 (N.J.C.). Autumn records from Oct. 27 to end year, but numbers small—max. of 8, Blagdon res., Oct. 28 and four, Chew Valley res., Dec. 11. Four flying W., Breach Hill, Chew Stoke, Nov. 19 (D.W.).

Buzzard *Buteo buteo*

G. and **S.** Records (203) for all months from 50 localities. Pairs present at Wotton-under-Edge, Cromhall, nr. Bath, Cleeve, Bleadon, Cheddar, Blagdon, Chewton Mendip and Chew Valley area in breeding season (D.B.W.P.S., J.H., R.J.P., D.W. *et al.*). Two breeding records (A.A.C., R.M.C., P.A.R.). Four together, Blagdon res., Jan. 30 (M.K.), Aug. 14 (P.A.R.), Cleeve, Feb. 26 (M.K.) and Chew Valley res., Apr. 10 (R.J.P.). Five, Blagdon res., Sept. 10 (M.K.). Single dead birds, Aust, Aug. 3 (T.R.J.) and Weston Beach, Dec. 11 (R.A.).

Sparrowhawk *Accipiter nisus*

G. and **S.** Reports (269) from 61 localities—ten in **G.**—all months. Nest with three young, Almondsbury, June 27 (A.E.B.). Juvs. reported from Weston Woods, Winscombe and Blagdon, July–Aug. (R.A., P.J.C., A.M.R.).

Goshawk *Accipiter gentilis*

S. Female escaped from falconer, Nailsea, Aug. 24, present in area 6–8 weeks later (J.L. per P.J.C.).

Marsh Harrier *Circus aeruginosus*

S. Single birds, Chew Valley res., Apr. 16 (R.M.C., T.C., C.E.D.S.), 18 (H.R.H.L.) and Stoke Moor, nr. Draycott on 24th (T.B.S.).

Hen Harrier *Circus cyaneus*

S. Ring-tail, Blagdon res., Feb. 22 seen by A.C.L. and H.W.N. who considered it to be this species. One, juv. ♀, mist-netted, Steep Holm, Oct. 9 (Res. Stn.) and male, seen Kenn Estuary, Nov. 20 (M.L.D., P.A.R.).

Osprey *Pandion haliaetus*

S. One Chew Valley res., April 16 (R.A., R.M.C., T.C.).

Hobby *Falco subbuteo.*

S. At least three pairs bred—*Eds.* Single birds: Brean Down, Apr. 15, Sept. 17 (T.R.J.W.); Barrow resrs., May 5 (E.K.); Uphill, May 28 (R.A.); Mendip area, May 28, June 8, 9 (D.E.L., S.J.M., R.J.P. *et al.*); Rickford, June 12 and West Harptree, Sept. 10 (R.A.). Two, Batheaston, May 14 (A.A.C., R.M.C., B.S.). One, sixteen dates, May 8–Sept. 4, Chew Valley res. (J.E.A., D.J.P., D.W. *et al.*) and two there, June 1 (R.S.H.).

Peregrine *Falco peregrinus*

G. New Grounds: ♂, first seen Oct. 13, 1965, until Apr. 20 (W.T.); ♀, Jan. 2, 11 (M.L.D., P.A.R., D.I.M.W.), Mar. 6 (R.M.C., B.K.) and ♂, Oct. 7–end of year (W.T.).

S. Single birds, Weston Bay, Apr. 23 (T.C., P.L.G.); Sand Point, July 7 (H.R.H.L.), Sept. 8 and Nov. 10 (R.A., T.B.); Brean Down, Sept. 9 (T.R.J.W.); Oct. 1 (R.F.T., P.T.) and Dec. 11 (M.L.D., P.A.R.). One, imm., Weston-s-Mare, Oct. 23 (P.C.).

MERLIN *Falco columbarius*

G. One, New Grounds, end Nov. (G.B.).

S. One, ♀ or imm., Sand Bay, Sept. 4 (R.A.). Single birds: Chew Valley res., Oct. 23 (D.S., R.F.T.) and 30th (C.V.R.S.); Brean Down, Oct. 25 (T.R.J.W.) and 29th (R.J.P.); Yeo Estuary, Oct. 30 (R.J.P.), Nov. 20 ♂, (M.L.D., P.A.R.), Dec. 4 (R.D.O., K.D.S.) and on 12th (R.D.O.); ♂, Locking Pond, nr. Weston, Nov. 2 (P.C.).

KESTREL *Falco tinnunculus*

G. Reports (226) include 15 localities where birds seen regularly in breeding season. One nest with three young, July 2 (A.A.C., R.M.C.).

S. Reports (512) from widespread localities, all months. Five nests—with 2, 2, 3, 4 and 5 young—June–early July (R.A., P.J.C., C.G., D.W.). Two juvs., Long Ashton, Aug. 10 (M.A.W.) and Sand Point, Aug. 28 (R.A.). Possibly seven, Chew Valley res., July 13 and nine on 17th (R.S.H.). Five within a mile, Priddy, Aug. 30 (H.W.N.). Steep Holm: ♀, resident; two, Sept. 30, Oct. 2 and three on 3rd (Res. Stn.).

RED-LEGGED PARTRIDGE *Alectoris rufa*

G. and **S.** Pair, Brean Down, six dates, Mar.–end May (R.A., D.E.L., R.D.O.); one, Middle Hope, Apr. 10, 17 (R.A.); one displaying, Velvet Bottom, June 7 (C.G.) and five, Wavering Down, Oct. 19 (A.M.R.). Two, Marshfield, May 21 (T.C., P.L.G.) and one on 30th (M.L.D., P.A.R.).

PARTRIDGE *Perdix perdix*

G. Twelve to 14 young, Almondsbury, "where species is now rare" (A.E.B.).

S. Coastal records: up to four, Brean Down, Jan.–Mar. (M.L.D., R.D.O., P.A.R.); two, Sand Point/Middle Hope, May (R.A., W.L.R.) and up to six, Clevedon–Yeo, Aug. and Nov. (R.A., K.J.H., H.W.N.). The only inland records are two, Chew Magna, Mar. 9 (D.W.); 4–5, Yatton, Aug.–Oct. (H.H.D.) and one, Blagdon, Oct. 28 (D.J.P.).

QUAIL *Coturnix coturnix*

G. One, Marshfield, June 28 (R.M.C.) and two, July 3 (R.H.).

WATER RAIL *Rallus aquaticus*

G. One, Lasborough Park, Feb. 27 (D.B.W.P.S.). One, Shortwood Brickworks, Bristol, Dec. 17, and two, Frampton Cotterell, on 28th (T.C., P.L.G.).

S. Nine records of up to six, Sand Bay, Jan., Mar. and Oct.–Dec. (R.A., T.B.S.). Up to four, Chew Valley res., Jan.–April, Aug.–Dec. (R.A., C.C.D., D.J.P. *et al.*)—a juv., Aug. 17 (T.C., K.E.V.). One, Blagdon res., Sept. 11 (P.J.C.) and one, Dundry, Oct. 21 (D.W.).

CORNCRAKE *Crex crex*

S. One, picked up dead, apparently accidentally killed, Lyncombe Hill, nr. Sandford, May 11 (F.G.V.G.).

COOT *Fulica atra*

S. Emborough Pond: noted, Jan. 1–May 7, with max. 27, Jan 3 falling to 12, Apr.–May; two, Aug. 15 (B.R.). Cheddar res.: 250, mid-Jan. rising to 400, Jan. 21, thence rapid fall to 45, mid-Feb. with one, Mar. 13; autumn counts—four, Aug. 8, rising to max. 1,800, mid-Nov., falling to 500, Dec. 23 (R.A., J.A.McG., B.R.)—cf. max. 380, mid-Nov., 1965. Other resr. records: 350, Blagdon, Jan. 8 and 330, Dec. 24 (R.A.); 350, Chew Valley, Jan 8 and 160, Dec. 24 (R.A.)—*cf.* 821, Blagdon, Dec. 12, 1965; 1,390, Chew Valley, Dec. 28, 1965.

OYSTERCATCHER *Haematopus ostralegus*

G. New Grounds: one, May 3; two, June 2; one frequently visited W.T. enclosures, feeding on lawns or consorting with captive birds, Aug. 1–Sept. 7 (L.P.A., M.A.O.). One, New Passage, Aug. 3 (T.R.J., S.J.M.).

S. Noted, coast, Jan.–Apr. and Oct.–Dec., with max., Weston Bay area, 120, Jan 22 and 140–150, Dec. 3, 16 (R.A., D.J.P., W.L.R., *et al.*). Chew Valley res.—July 9–Aug. 29 with max., ten, Aug. 4 (R.A., R.M.C., R.J.P. *et al.*).

LAPWING *Vanellus vanellus*

G. and **S.** Breeding season records only from Almondsbury; Clapton and Tickenham moors; and Blagdon and Chew Valley resrs. (R.A., A.E.B., P.J.C., S.M.T.). Largest flocks: 1,000–1,500, Yeo and Axe estuaries, Oct.–Dec., with 4,000 in latter area, Dec. 27 (R.A., N.J.C. *et al.*). Movements noted: *c.* 120 to S., Brandon Hill, Bristol, Jan. 11 (R.D.O.); 'large numbers' to N., Clevedon, Jan. 26 (A.J.T.); 140 to E., Nailsea, Jan. 27 (M.V.T.); 2,500–3,000 to S.W., Yeo Estuary, Dec. 4 (R.D.O.).

RINGED PLOVER *Charadrius hiaticula*

G. and **S.** Largest counts: 80, New Grounds, May 3 and 700, Aug. 21 (L.P.A.); 111, Sand Bay, May 22 and *c.* 150, Aug. 21 and Sept. 4 (R.A.). Up to 13, Chew Valley res., July 24–Oct. 22 (P.J.C., E.G.H., W.J.S. *et al.*). Three, Cheddar res., Sept. 4 (R.M.C.).

LITTLE RINGED PLOVER *Charadrius dubius*

G. and **S.** One, New Grounds, Aug. 7 (L.P.A.). Chew Valley res.: one, Apr. 24 (W.J.S.); many reports of one ad. and one imm. (separate), mid-July to mid-Sept. (G.L.B., N.J.C., T.C. *et al.*).

KENTISH PLOVER *Charadrius alexandrinus*

S. Male, Chew Valley res., Apr. 13. Details reported include blackish legs and bill; crown and nape brighter than pale brown wings, and with blackish frontal patch; small black patch either side of breast instead of complete band; narrow white wing-stripe visible in flight (P.C., D.J.P.). Second Somerset record.

GREY PLOVER *Charadrius squatarola*

G. and **S.** Up to four, various coastal sites, Feb.–May and Sept.–Dec.; two, Chew Valley res., May 28 and one, Oct. 8 (L.P.A., J.F.B., K.J.H., R.D.O. *et al.*).

GOLDEN PLOVER *Charadrius apricarius*

S. Chew Valley res.: ten, Jan. 9 (A.M.R.); one, Aug. 22 (T.C., D.S.); *c.* 25, early Oct., incr. to *c.* 150 at end of month and decr. to *c.* 25 in Dec. (32 reports, 15 observers), but *c.* 300, Oct. 12 (N.T.L.). 45, Marksbury, Mar. 20 (M.J.A.); 12, Charmy Down, Bath, Apr. 23, and 100, Oct.–Nov. (R.M.C., R.J.L.); one, Mendip, Sept. 9 (V.G.). Coastal records: 165, Kingston Seymour, Jan. 10 (R.J.P.); up to 400, Weston Bay area, Oct.–Dec., with max. of 1,000, Nov. 27, and 600, Dec. 27 (R.A., T.B.S.).

TURNSTONE *Arenaria interpres*

G. and **S.** One, sometimes two, on coast, May, Aug. and Sept., and up to eight, Dec.; up to three, Chew Valley res., July 24–Aug. 24 (L.P.A., R.A., T.R.J., D.J.P. *et al.*).

COMMON SNIPE *Capella gallinago*

G. and **S.** Coastal records include 75, Axe Estuary, Feb. 19, and 19, same place, Nov. 13 (M.L.D., D.J.P., P.A.R.). Chew Valley res.: up to 14, Jan.–Feb.; up to 20, Aug. 16–Sept. 24, then 50–70 to end of year (R.A., T.C., T.R.J. *et al.*).

JACK SNIPE *Lymnocryptes minimus*

G. and **S.** Single birds: Sand Bay, Feb. 15 (R.A.); Axe Estuary, Feb. 21 (M.L.D., P.A.R.); New Grounds, Oct. 14 and Nov. 17

(M.A.O.); Priddy Pools, Nov. 10 (J.A.McG.). Two, Portbury, Oct. 13 (N.T.L.). Chew Valley res.: single birds, Jan., Feb. and Sept.; up to six, Oct.–Dec., with nine, Nov. 27 (N.J.C., W.J.S., D.W. *et al.*).

WOODCOCK *Scolopax rusticola*

G. and **S.** Nineteen records of up to four, Jan.–Mar. and Oct.–Dec., from Filton, Walton Moor, Clevedon, Weston Woods, Brean Down, Cleeve, Churchill, Winscombe, Cheddar Wood, Velvet Bottom and Coley Hill (T.B., T.B.S., D.W., T.R.J.W. *et al.*). Heard roding on Mendip, May 28 and June 8 (C.G.).

CURLEW *Numenius arquata*

G. and **S.** Largest counts: 105, Sand Bay, Feb. 13; 342, New Grounds, Oct. 12; 150, Axe Estuary, Dec. 27 (L.P.A., R.A.). Chew Valley res.: up to four, Apr. and June–Sept., with up to 12 in Aug. One in display flight, Clapton Moor, May 14 (P.J.C.).

WHIMBREL *Numenius phaeopus*

G. and **S.** Noted on both passages, Apr. 16–May 27 and July 9–Sept. 18; one with defective wing, Yeo Estuary, last seen Oct. 22. Max. counts: 25, Kenn Moor, May 3 (S.M.T., G.W.), and ten, Woodspring Bay, Aug. 19 (R.A.). One, sometimes two, Chew Valley res., Apr., July and Aug. (R.M.C., P.A.R. *et al.*).

BLACK-TAILED GODWIT *Limosa limosa*

G. Up to three, Apr.–May and up to nine, July 3–Nov. 17 with peak of 25–30, mid-Sept. (L.P.A., M.A.O.).

S. Chew Valley res.: one, April–May and up to six, July 24–Sept. 5 (C.E.B., T.C., H.W.N. *et al.*). Weston Bay: ten, Sept. 18, rising to 140–160, end Oct.–early Nov. (R.A., D.J.P.) then falling to *c.* 80 by mid-Nov., and *c.* 50 by end of year (P.C., H.R.H.L., T.R.J.W. *et al.*).

BAR-TAILED GODWIT *Limosa lapponica*

G. New Grounds: 65–85, Apr. 30–May 7, and up to 14, Aug. 14–Nov. 17 (L.P.A., M.A.O.). Six near Aust, Sept. 14 (C.A.P.).

S. Six, Weston Bay, Feb. 4 (H.R.H.L.); *c.* six, Sand Bay and Weston Bay, Sept. 17–Nov. 20, then 12 to 17 to end of year, with 25, Dec. 10 (J.E.A., R.A., W.L.R. *et al.*). Chew Valley res.: two, Sept. 2 and one on 18th (P.L.G., W.J.S.).

GREEN SANDPIPER *Tringa ochropus*

G. and **S.** One, sometimes two, New Grounds, July 1–Aug. 27 (L.P.A.). Single birds: Priddy Pools, July 23 (R.M.C.); Sand Bay, Aug. 29 (R.A.); Lox Yeo river, Sept. 16 (J.F.R., G.S.); Stoke Moor, Nov. 8 (B.R.); Nailsea Moor, Dec. 17 (T.R.J.W.) and Kingston Seymour, Dec. 31 (H.R.H.L.). Resrs.: single birds, Chew

Valley, Jan. 16 and Apr. 20 (R.J.P.); up to 16, same place, July–late Aug., then one or two until Oct. 17 (R.A., R.M.C., N.T.L., A.P.R. *et al.*); one, Blagdon, Sept. 15 and one, sometimes two, Cheddar, Aug. 15–Oct. 16 (J.A.McG., B.R.).

WOOD SANDPIPER *Tringa glareola*

S. One, Axe Estuary, Apr. 20 (H.R.H.L.). Up to six, Chew Valley res., May 29–Sept. 4 (30 reports, 20 observers). One, Cheddar res., Sept. 24, 25 (P.L.G., R.J.L.).

COMMON SANDPIPER *Tringa hypoleuca*

G. and **S.** City of Bristol: up to eight, R. Avon, Sea Mills, Feb.–May and July–Dec. (J.F.B., N.T.L., J.F.R., K.B.Y.); one, Floating Harbour, May 21 (B.R.). Resrs. and coast: 16 reports, Apr.–May, with max. of nine, Cheddar res., Apr. 21 (J.A.McG.); 56 reports, July–Dec., with up to 20, Chew Valley res., and max. elsewhere of nine, Woodspring Bay, July 29 (R.A.) and eleven, Cheddar res., Aug. 23 (B.R.).

REDSHANK *Tringa totanus*

G. Fifty, New Grounds, Aug. 21—'a high count' (L.P.A.). City of Bristol: up to ten, R. Avon, Sea Mills and Shirehampton, Jan., Feb., and Aug.–Dec., but 60–70, Jan. 15, in snowy weather (J.F.B., C.G., J.F.R.).

S. Breeding season records from Yeo Estuary, where at least one pair bred (W.L.R.) and Clapton Moor (P.J.C.). Coastal flocks: winter max.—50, Weston Bay, Jan. 23 (R.A.); 19 reports, July–Dec., with max., all in Weston-s-Mare area, of *c.* 80, July 17 and Oct. 2, and *c.* 60, early Dec. (J.E.A., R.A., D.J.P. *et al.*).

SPOTTED REDSHANK *Tringa erythropus*

G. and **S.** New Grounds: two, May 1; six, June 1; up to nine, July 9–end of Sept.; 13, Oct. 12 (L.P.A.). Yeo to Axe estuaries: one, sometimes two, Jan. 9, May 2 and Aug.–Dec. (R.A.). One, Clevedon Pill, Oct. 2 (A.J.T.). Up to 12, Chew Valley res., July 23–Oct. 25 (57 reports); two, Blagdon res., Sept. 11 (P.J.C.).

GREENSHANK *Tringa nebularia*

G. and **S.** Single birds—Sand Bay, Apr. 17 and New Grounds, May 1; up to six, various coastal localities, July 15–Oct. 16 (L.P.A., R.A., J.F.B., C.A.P., P.A.R.). One, R. Avon, Shirehampton, Oct. 30 (J.F.B.). Resrs.: (67 reports, July 3–Oct. 23): up to 17, Chew Valley (22 observers); up to four, Blagdon (P.J.C., R.M.C., H.W.N., C.A.P.); one, Cheddar (J.A.McG., B.R.).

KNOT *Calidris canutus*

G. and **S.** New Grounds: 14, May 3; up to five, June 1–Aug. 15; 22, Sept. 25 (L.P.A.). One, Chew Valley res., Sept. 21 (A.M.R.).

Only coastal counts over 25 were 170, Weston Bay, Jan. 22 and 200, Sand Bay, Oct. 30 (R.A.)—a reversion to pre-1960 numbers, cf. *Proc. B.N.S.*, 1965, p. 153.

PURPLE SANDPIPER *Calidris maritima*

S. One, Brean Down, Nov. 13 (R.M.C.).

LITTLE STINT *Calidris minuta*

G. and **S.** Single birds—New Grounds, May 17, Sept. 18 and Nov. 18 (L.P.A.); Sand Bay, Sept. 4 (R.A.); and Axe Estuary, Nov. 6 (P.C.). Chew Valley res.: one, May 22 and up to three, July 26–Oct. 29 (19 reports, 14 observers).

DUNLIN *Calidris alpina*

G. and **S.** Max. counts—**G.**: 400, New Grounds, May 3 and 1,400, July 30 (L.P.A.);—**S.**: 2,000, Sand Bay, Nov. 13 and 1,600 Dec. 4 (R.A.). Up to 12, resrs., Apr.–Dec. (30 reports, 11 observers).

CURLEW SANDPIPER *Calidris testacea*

G. and **S.** Single birds: New Grounds, Sept. 12–16 (L.P.A., M.A.O.); New Passage, Oct. 24 (M.L.D., P.A.R.). Up to three, Chew Valley res., Aug. 27–Oct. 21 (R.A., P.J.C., E.M.P., A.M.R. *et al.*).

SANDERLING *Crocethia alba*

G. and **S.** Coastal records of up to *c.* 20, Jan., Apr.–July and Oct–Dec., but 38, New Grounds, June 1 (L.P.A.). One, Chew Valley res., Oct. 16 (P.J.C.) and two on 19th (D.W.).

RUFF *Philomachus pugnax*

G. and **S.** New Grounds: up to eight, Sept. 13–17 and eleven, Nov. 17 (L.P.A.). One, Sand Bay, July 26 (P.C.). Chew Valley res.: one, Mar. 20–30; up to 16, May 8–end Sept.; then up to five, to Nov. 12 (62 records, 26 observers).

AVOCET *Recurvirostra avosetta*

S. One, Sand Bay, Dec. 29, 30. Details supplied (T.B. per R.A.).

GREY PHALAROPE *Phalaropus fulicarius*

S. One, Chew Valley res., Sept. 7. Details supplied (P.D., C.S.S.).

LESSER BLACK-BACKED GULL *Larus fuscus*

S. Birds considered to be of the Scandinavian race *L. f. fuscus* reported from Weston-s-Mare, Feb. and Apr., and Chew Valley res., early Sept., but conditions of observations not stated—see foreword.

COMMON GULL *Larus canus*

S. Mainly reported from resrs., especially Chew Valley, where 5,000 roosting, Dec. 27 (P.J.C.).

MEDITERRANEAN BLACK-HEADED GULL *Larus melanocephalus*

S. One in almost adult plumage, Chew Valley res., July 9 (F.G.O.). Details supplied include: black hood reaching well down neck almost to mantle; pale grey wings with fawn markings; red bill, decurved at tip, darkening in colour towards base; heavier build than Black-headed Gulls and less buoyant flight.

LITTLE GULL *Larus minutus*

S. One, Chew Valley res., Apr. 2 (R.M.C.); one ad., Aug. 22, 23 (C.E.B., T.C.); ad. and imm., Aug. 24–29 (G.L.B., W.L.R. *et al.*); two imms., Sept. 3 (R.M.C.) and one, Sept. 7–18 (R.B., P.L.G. *et al.*).

BLACK-HEADED GULL *Larus ridibundus*

G. and **S.** Up to 1,200, Durdham Down, Bristol, early morning, Jan. 10, Feb. 4, and 1,000, Dec. 22 (R.A.). Melanistic bird, Chew Valley res., Jan. 23 (A.P.R.)—possibly same bird as one seen at Filton, Feb. 14 (R.A.). Roost counts include: 1,000, Woodspring Bay, Aug. 12, and 2,000 on 19th (R.A.); at least 7,500, Weston Bay, Sept. 30 (P.C.) and 2,500, Dec. 25 (R.A.); over 5,000, Chew Valley res., Dec. 18 and 7,500 on 27th (P.J.C.).

KITTIWAKE *Rissa tridactyla*

G. First-winter bird, City Docks, Bristol, Dec. 27 (P.J.C., M.A.W.).

S. Dead ad., Cheddar res., Mar. 9; imm., same res., Mar. 9–13 (B.R., J.A.McG. *et al.*). Imm. flying down channel, Portishead, Mar. 17 (W.L.R.). Small 'wreck', end Mar.–early Apr.—three (2 ads.), Cheddar res., Mar. 28, 31 (B.R.) and five (3 ads.), Apr. 2 (R.M.C.); single imm., Apr. 3 (J.A.McG.) found dead on 8th (R.A.). Dead ads.; Chew Valley res., Apr. 1, 3; Sand Bay, Apr. 3 and Brean Down on 11th (R.A., D.J.P., B.R.). Imm. off Clevedon, June 6 (P.L.G.).

BLACK TERN *Chlidonias niger*

G. One, New Grounds, June 2 (L.P.A.) and 9, Sept. 2 (T.R.J.).

S. Ten, Chew Valley res., May 1 (M.H.) and one, Blagdon res. on 14th (R.A.). Movement noted, Chew Valley res., end May: six on 28th (R.S.H.); 16 on 29th (W.J.S.); 100 passed through on 30th (P.L.G.) and 50+ on 31st (T.R.J., S.J.M.); 17, June 1 (R.S.H.) and one on 3rd (R.A.). Autumn passage, Aug. 13–Oct. 30: 11 flying W., Charterhouse, Mendip, Aug. 13 (T.B.S.) and three, Blagdon, same date (P.J.C.); three, Woodspring Bay, Aug. 15

(T.B.); peak numbers, Chew Valley res.—25, Aug. 29 (P.J.C., R.M.C.); 30–40 on 30th (H.W.N., D.W.); 25, Sept. 3 (T.R.J.) and nine on 7th (P.L.G.); five, Cheddar res., Sept. 4 (R.M.C.).

White-winged Black Tern *Chlidonias leucopterus*

S. Juv. with Black Terns, Chew Valley res., Aug. 24–27. First seen by D.W. and later in day by G.L.B., R.M.C. and B.K. Record, third for district and second for Somerset—cf. *Proc. B.N.S.*, 1949, p. 38 and 1960, p. 129—accepted by *Brit. Birds* Rarities Committee.

Common Tern *Sterna hirundo* Arctic Tern *Sterna macrura*

G. Two over estuary, New Grounds, May 29 (L.P.A.), Sept. 2 (T.R.J.) and one, New Passage, Sept. 14 (R.A., C.A.P.).

S. Spring migrants: one, Blagdon res., Apr. 16, 17, and three on 24th (J.E.A., W.L.R. *et al.*); two, Cheddar res., May 7 (R.M.C.); three, Sand Bay, May 21 (D.J.P.); and six, Chew Valley res., on 30th (T.C., P.L.G.). All autumn records of less than ten birds, except 42, Chew Valley res., Aug. 13 (R.M.C.) and 25 on 17th (T.R.J.).

Little Tern *Sterna albifrons*

G. One over estuary, New Grounds, May 1 (L.P.A.).

S. Two, Chew Valley res., Sept. 10 (T.C.).

Sandwich Tern *Sterna sandvicensis*

S. Party of four, considered to be of this species, Chew Valley res., Apr. 24 (M.L.D., P.A.R.).

Little Auk *Plautus alle*

G. One picked up alive, but died later, Severn bank nr. Oldbury-upon-Severn, *c.* Feb. 6 (per H.D.).

Razorbill *Alca torda*

S. Single dead birds, Weston Bay, Dec. 10 and Sand Bay on 11th (R.A.).

Guillemot *Uria aalge*

S. Single dead adults, Sand Bay, Apr. 3, Aug. 14 (R.A.).

Stock Dove *Columba oenas*

G. Breeding records from Dursley, Littleton-upon-Severn and Tockington (A.E.B., D.B.W.P.S.).

S. Small numbers, Sand Point, Jan., Nov. and Dec. (R.A.) and Stoke Moor, Feb. (T.B.S.). Breeding season records from 1965 localities and Shipham, Crook Peak, Charterhouse, Tickenham and Flax Bourton (R.A., T.B.S., T.R.J.W.).

TURTLE DOVE *Streptopelia turtur*

G. Reports from Lasborough Park and Dursley (D.B.W.P.S.); Inglestone Common, Filton and New Passage (R.A., N.J.C., C.A.P.).

S. Reported from Uphill, Weston Woods, Sand Point, Burrington, Blagdon res., Hunstrete, Brockley, Walton, Cadbury Camp, Ashton Hill and Leigh Woods, May–Sept.; one, Chew Valley res., Oct. 22—late date (R.A., G.E.C., H.H.D. *et al.*).

COLLARED DOVE *Streptopelia decaocto*

G. Breeding reported from Slimbridge and W.T. enclosures where flock increased from 100 to *c.* 200 by year end (M.A.O.). Numbers also increasing in Bristol (C.G. *et al.*). At least 150 feeding, Avonmouth Docks, early in year; recoveries of birds ringed there by P.J.C. and C.L. include:—

Ringed				Recovered
3088672, Juv.,	30.8.65	:	22.3.66	on fishing boat in approaches to St. George's Channel, 400 m. W.S.W.
3088762, 1st. W.	2.1.66	:	7.8.66	Troqueer, Maxwelltown, 250 m. N.
3088671, Juv.,	30.8.65	:	15.6.66	Drogheda, Louth, 215 m. N.W.
3088585, Ad.	25.10.64	:	16.9.66	Kilrush, Clare, 295 m. W.N.W.

S. Extension of range continues: breeding or breeding season records from Pill, Easton-in-Gordano, Lodway and Ham Green (J.F.B.), Leigh Woods (P.J.C.), Nailsea and Backwell (H.H.D., S.M.T.), Clevedon (A.J.T.) and Weston-s-Mare (R.A.).

CUCKOO *Cuculus canorus*

G. and **S.** Reports from 39 localities (7 in **G.**). Juvs. seen, Bishop Sutton, Charterhouse and Cheddar Wood, July–Aug. (R.A., T.C., T.B.S., D.W. *et al.*).

BARN OWL *Tyto alba*

S. Single birds, Stoke Moor, Jan. 30 (T.B.S.); Woodspring Bay, Oct. 12 (T.B. per R.A.); Farmborough, Nov. 10 and on 29th (D.W.) and Sand Point, Dec. 21 (R.A.). Up to three, Chew Valley res.—56 records—Jan.–May, July and Nov.–Dec. (R.H., D.J.P., M.A.W. *et al.*).

LITTLE OWL *Athene noctua*

G. and **S.** Reports (87) from 41 localities—10 in **G.**—all months. All refer to one or two heard, except six, Yeo Estuary, Oct. 2 and four on 9th (M.K.). Reported breeding, Brean Down and Goblin Combe (M.K., T.R.J.W.).

TAWNY OWL *Strix aluco*

G. and **S.** Reports (109) from 39 localities—9 in **G.**—all months. Breeding records:—**G.** New Grounds (L.P.A.) and Redland, Bristol (C.G.); juvs. reported, Brentry, Stoke Bishop and Clifton (P.J.C., A.P.R., J.F.R.);—and **S.** Clevedon (A.J.T.).

Short-eared Owl *Asio flammeus*

S. One, Wavering Down, Nov. 6 (A.M.R.).

Nightjar *Caprimulgus europaeus*

S. One seen and heard, east side, Cheddar Wood, May 31 (T.B.S.) and one heard after dark, Wrington Warren, June 8 (C.G.).

Swift *Apus apus*

G. and **S.** Early and late dates: one, Weston-s-Mare, and two, Chew Valley res., Apr. 20 (R.A., E.M.P.), and three, Sand Point, Aug. 28 (R.A.). Ad. ringed Chew Valley res., July 19, caught on nest site, Hanham (9 miles N.N.E.) next day (B.R.G.).

Kingfisher *Alcedo atthis*

G. and **S.** Considerable recovery from severe losses of 1963—81 reports, all months, from 21 widely separated localities, including breeding season records from Tockington; Midford (Bath); Knowle Hill, nr. Bishop Sutton; and Blagdon, Chew Valley and Litton resrs. (A.E.B., P.J.C., R.M.C. *et al.*).

Bee-eater *Merops apiaster*

S. Brief views, not more than 45 secs., of one flying nr. Herriott's Bridge, Chew Valley res., Aug. 15. Bird first recognized by its characteristic calls. Long wings, tail and bill noted, also erratic and undulating flight. Plumage details included: bronze upper-parts, yellow throat and bright turquoise under-parts (D.S., R.F.T.). Record accepted by *Brit. Birds* Rarities Committee.

Hoopoe *Upupa epops*

S. One on croquet lawn, West Park, Clapton-in-Gordano, June 4 to 8 (first seen by Mrs. H.H.D. and afterwards by A.M.G.C., B.K., M.A.W. *et al*). Bird also seen on neighbouring lawn on 7th (D.J.H.).

Green Woodpecker *Picus viridis*

G. and **S.** Apparently now recovered from 1963 losses—reported, all months, from 67 localities. Nesting, or fledged young, reported from Henbury (T.R.J.); Chew Valley and Worlebury (R.A.); Clapton-in-Gordano (H.H.D.); Shipham (T.B.S.) and in Bath area (R.M.C.).

Great Spotted Woodpecker *Dendrocopos major*

G. and **S.** 67 reports, all months (41 in Apr.–June) from 36 localities, rural and suburban.

Lesser Spotted Woodpecker *Dendrocopos minor*

Single birds: **G.**—Downend Woods, Jan. 3 (P.A.R.); **S.**—Chew Valley, Jan. 9 (A.M.R.) and Feb. 13 (P.J.C.); Blagdon, Mar. 6

(P.J.C.); Clevedon, Mar. 17 (A.J.T.); Long Ashton, Apr. 27 (G.E.C.); Saltford, Aug. 7 (G.S.) and Bleadon village on 14th (P.A.R.); Weston Woods, Oct. 11 (T.B. per R.A.).

WRYNECK *Jynx torquilla*

S. One, Brean Down, Sept. 7, and two on 9th (T.R.J.W.).

WOODLARK *Lullula arborea*

S. Three, Sand Point, Nov. 1 (T.B.).

SWALLOW *Hirundo rustica*

G. and **S.** First migrants, New Grounds, Mar. 17 (T.R.J.). Large roost, Chew Valley res., Aug.–Sept., with max. *c.* 3,000, Aug. 29 (per M.K.).

SAND MARTIN *Riparia riparia*

S. Only breeding record: wall drains, Keynsham (per S.M.T.).

GOLDEN ORIOLE *Oriolus oriolus*

S. One, Cleeve, June 16 (*Field*, 30.6.66): "A yellow bird about size of Blackbird with black wings and reddish-brown beak."

RAVEN *Corvus corax*

G. and **S.** Records (22) of one or two, Jan.–May and Sept.–Dec. from Bristol, Cadbury Camp, and Weston-s-Mare and Mendip areas (14 observers). Brean Down: two unsuccessful breeding attempts; up to four noted most months (R.A., R.M.C., R.J.L. *et al.*). Steep Holm: one or two, Sept.–Oct., but no sign of earlier breeding (Res. Stn.).

ROOK *Corvus frugilegus*

G. Sample of 28 Rookeries in Severn Vale contained 453 nests—*c.* 19% less than in 1964 (J.H.).

WILLOW TIT *Parus montanus*

S. Single birds, Abbot's Pool, Mar. 13 (A.P.R.) and Stowey Sutton, Aug. 24 (D.W.). Details supplied.

BEARDED TIT *Panurus biarmicus*

S. Heard calling from reedbed, Chew Valley res., Jan. 5 (D.W.). One, same place, Dec. 23 (W.L.R.).

WREN *Troglodytes troglodytes*

G. and **S.** Reports suggest now recovered from 1963 losses. Steep Holm: post-breeding population unusually large—*c.* 50 (Res. Stn.).

DIPPER *Cinclus cinclus*

S. Midford–Combe Hay: three pairs, Apr. 23 (D.A.C.); nest with three infertile eggs, Apr. 28 (K.A.H.); single birds, June 19 and Oct. 22 (R.M.C., R.H.).

RING OUZEL *Turdus torquatus*

S. Woodspring Bay, Sand Point and Brean Down: up to three, Mar. 30–Apr. 17 (9 reports) and Aug. 31–Oct. 18 (7 reports) (R.C.L., D.E.L., D.J.P. *et al.*). Single birds, Steep Holm, Oct. 1–7 (Res. Stn.).

WHEATEAR *Oenanthe oenanthe*

G. and **S.** Up to six (34 reports, mainly from coast and resrs.), Mar. 18–May 22 and July 20–Oct. 22, but 12, Sand Bay, Apr. 17 and 11, Brean Down, Aug. 17. No reports of breeding since 1963.

STONECHAT *Saxicola torquata*

G. and **S.** Up to five, Brean Down (where at least one brood reared) and one or two, Sand Point, Jan.–June and Nov. (R.A., R.M.C., T.R.J.W. *et al.*). Winter records: Filton, Clevedon, Compton Bishop, and Blagdon and Chew Valley resrs. (E.G.H., H.W.N., W.J.S., D.W. *et al.*).

WHINCHAT *Saxicola rubetra*

G. and **S.** Breeding season reports from Charterhouse (D.E.L.) and Chew Valley res. (W.L.R., W.J.S. *et al.*). Spring and autumn: 36 reports of up to 12, from Filton resrs., Mendip and coast.

REDSTART *Phoenicurus phoenicurus*

G. and **S.** Bred, Durdham Down (C.E.H., J.F.R.), Leigh Woods —2 or 3 prs.—(J.E.A., P.J.C.) and Goblin Combe (P.J.C.). Singing ♂♂, Oakford, nr. St. Catherine, May 14 (R.M.C.), Ashton Park, May 23 (R.A.) and Brockley Combe (P.J.C.). Also 18 records, April, and 35, July–Sept., from widespread localities.

BLACK REDSTART *Phoenicurus ochruros*

Records of single birds—**G.**: New Passage, Apr. 29 (C.A.P.); St. George, Bristol (♂), Oct. 22 (W.J.S.);—and **S.**: Brean Down, Jan. 5 (♀ or imm.) (E.G.H.), Nov. 6 and 27th; Cheddar, Oct. 11 per M.K.).

NIGHTINGALE *Luscinia megarhynchos*

Reports of singing ♂♂:—**G.**: Inglestone Common; Frampton Cotterell; Oakford; Filton; Stoke Bishop and Niblett's Hill, Bristol; —**S.**: Leigh Woods; Ashton Park; Tickenham; Brockley Combe; Winscombe; Cheddar Wood; Midford; and Bailey's Wood, Bath (T.C., C.G., P.L.G., H.R.H.L. *et al.*).

GRASSHOPPER WARBLER *Locustella naevia*

G. and **S.** Singing ♂♂ noted from 22 localities (18 observers). Eleven, Brean Down, Apr. 24 (per S.M.T.) and 11, Oakford on 26th (R.M.C.).

REED WARBLER *Acrocephalus scirpaceus*

G. and **S.** Breeding season records from Littleton-upon-Severn, Bleadon and Chew Valley res. (R.A., W.L.R. *et al.*).

AQUATIC WARBLER *Acrocephalus paludicola*

S. Juv., trapped Chew Valley res., Aug. 13 (C.V.R.S.). Full description mentions resemblance to Sedge Warbler, but with buff stripe down centre of crown, heavily streaked upper parts including rump, black streaks on flanks and prominent rictal bristles. Record, third for area, accepted by *Brit. Birds* Rarities Committee.

BLACKCAP *Sylvia atricapilla*

S. Pair, feeding in garden, Weston-s-Mare, Dec. (J.G., P.G.).

LESSER WHITETHROAT *Sylvia curruca*

G. and **S.** Breeding season records

	1964	1965	1966
Localities	28	18	15
Observers	17	11	10

CHIFFCHAFF *Phylloscopus collybita*

G. and **S.** At least 20 pairs, Brockley Woods, Cleeve, May–June (P.J.C.). Winter records, probably this species, Chew Valley res., Jan. 9 (W.J.S.) and Dec. 11 (per M.K.), and Rodway Hill, Dec. 3 (P.L.G.).

WOOD WARBLER *Phylloscopus sibilatrix*

G. Two, Kingsweston Down, May 9 (N.J.C.). Single birds: Dursley, Littleton-upon-Severn, Blaise Woods, Stapleton and Oakford, Apr.–June (R.M.C., P.L.G., R.H.).

S. Up to four, Leigh Woods (one nest, P.J.C.), Abbot's Pool, Brockley Combe, Goblin Combe, Clevedon, Weston Woods, Rickford and Rookham Wood, Wells, Apr.–June (K.J.H., N.T.L., J.A.McG. *et al.*).

PIED FLYCATCHER *Muscicapa hypoleuca*

G. and **S.** One or two, Dodington Park, Long Ashton, Clapton Moor, Weston-s-Mare, Brean Down, Shipham and Chew Valley res., April 16–27 (J.E.A., D.E.L., D.J.P., B.R. *et al.*). One, ♀ or imm., Sand Bay, Sept. 25 and Filton, Sept. 27 (R.A.); two, Winscombe, Sept. 28 (A.M.R.).

TREE PIPIT *Anthus trivialis*

G. and **S.** Bred Leigh Woods, Goblin Combe–Wrington Warren—where at least nine pairs present (P.J.C.)—and Chew Valley res. (P.L.G.). Breeding season records from Wotton-under-Edge, Oakford (12 pairs—A.A.C), Filton, Long Ashton, Tickenham, Sand Point, Velvet Bottom and Clutton (W.L.R., D.W. *et al.*).

Rock Pipit *Anthus spinoletta petrosus*

S. Single birds, Blagdon res., Apr. 3 and Chew Valley res., Oct. 16 (P.J.C.).

Water Pipit *Anthus spinoletta spinoletta*

S. Up to three, Chew Valley res., Jan.–Apr. (P.J.C., B.R. *et al.*), and Cheddar and Chew Valley resrs., Oct.–Dec. (11 observers).

Pied Wagtail *Motacilla alba yarrellii*

S. Roost of *c.* 300, Chew Valley res., Oct. 30 (per M.K.).

White Wagtail *Motacilla alba alba*

G. and **S.** Spring passage records of up to eight, Filton, Clevedon, Sand Bay, Uphill, and Cheddar and Chew Valley resrs. (9 observers).

Waxwing *Bombycilla garrulus*

G. and **S.** Up to ten, Long Ashton, Jan. 3 (G.A.B.); single birds, New Grounds, Jan. 11 (D.I.M.W.), Uley nr. Dursley, Feb. 7 (per C.M.S.), and Downend Wood, Feb. 13 (M.L.D., P.A.R.).

Red-backed Shrike *Lanius collurio*

S. Juv., Sand Bay, Sept. 11 (R.A.).

Hawfinch *Coccothraustes coccothraustes*

S. Single birds, Bath (R.M.C.) and Wraxall (G.A.B.), Mar. 29; Ashton Park, May 23 (R.A.); Goblin Combe, June 3 (P.J.C.).

Siskin *Carduelis spinus*

G. and **S.** Parties of up to 25, Oakford, Draycott Moor, and Barrow and Blagdon resrs., Jan.–Mar. (P.J.C., R.M.C., R.H., T.B.S.), and Sand Point, Mendip Forest and Blagdon and Chew Valley resrs., Nov.–Dec. (T.B., R.M.C., J.A.McG., C.A.P.). Widespread reports of up to four.

Redpoll *Carduelis flammea*

G. and **S.** Single birds and parties of up to 30, reported from 24 coastal and inland localities, Jan.–May, Aug.–Dec. (13 observers).

Serin *Serinus canarius*

S. Single bird, Brean Down, May 8, 1965 (T.R.J.W.). Details included: little larger than Blue Tit, with bright yellow forehead, throat, breast and rump. Record, accepted by *Brit. Birds* Rarities Committee, is second for area—cf. *Proc. B.N.S.*, 1961, p. 268.

Crossbill *Loxia curvirostra*

S. One ♂, Abbot's Pool, Mar. 31 (A.P.R.). Largest influx since

1963: 16, Stock Hill, Mendip, June 30 (S.I.B.); 20, Blagdon, July 14 (per M.K.); 20, Weston Woods, Sept. 5 (R.A.); *c.* 20, Ashton Hill, Sept. 17 (T.R.J.W.) and Oct. 30 (per M.K.); 16, Portbury, Dec. 18 (per M.K.). Reports of up to 12 from 12 localities, July–Dec.

BRAMBLING *Fringilla montifringilla*

G. and **S.** Reports of up to 65 from 17 localities, Jan.–Mar., Oct.–Dec. (11 observers).

CORN BUNTING *Emberiza calandra*

G. Six ♂♂, Marshfield, May 21 (T.C., P.L.G.) and two, Acton Turville, July 3 (A.P.R.).

S. Up to three reported, Sand Point, Cheddar Gorge, Black Down, Yoxter, Chew Valley res., Charmy Down, Lansdown, June–Oct. (R.M.C., C.G., T.B.S. *et al.*).

CIRL BUNTING *Emberiza cirlus*

S. Breeding season records: Worlebury, Cheddar, Draycott and Chew Valley res. (R.A., N.J.C., T.R.J. *et al.*).

LAPLAND BUNTING *Calcarius lapponicus*

S. Single birds: Chew Valley res., Feb. 13 (H.A.T.); Yeo Estuary, Sept. 25 (T.B.S.) and Oct.–Nov. (G.W.B., T.C., P.L.G., T.A.G.); Kingston Seymour, Dec. 4 (K.B.Y.).

SNOW BUNTING *Plectrophenax nivalis*

G. Four, New Grounds, Jan. 11, and three on 19th (D.I.M.W.).

S. Up to eight, Clevedon, Nov. 13 (W.B.C., K.J.H.) and four, same place, Nov. 17 (R.H.). One, Yeo Estuary, Dec. 3 and three, Sand Bay, Dec. 21, 30 (T.B.).

TREE SPARROW *Passer montanus*

G. and **S.** Breeding reported, Acton Turville (A.P.R.) and Chew Valley res. (W.J.S.). Reports of up to 27, all months, from 12 localities (10 observers).

SPECIES REPORTED BUT NOT INCLUDED IN THE SYSTEMATIC LIST:

Residents: Cormorant, Mute Swan, Pheasant, Moorhen, Great Black-backed Gull, Herring Gull, Woodpigeon, Skylark, Carrion Crow, Jackdaw, Blue Tit, Coal Tit, Marsh Tit, Long-tailed Tit, Nuthatch, Treecreeper, Mistle Thrush, Blackbird, Robin, Goldcrest, Dunnock, Meadow Pipit, Grey Wagtail, Starling, Greenfinch, Goldfinch, Linnet, Bullfinch, Chaffinch, Yellowhammer, Reed Bunting, House Sparrow.

Summer or Winter Visitors and Passage Migrants: Fieldfare, Redwing, Sedge Warbler, Garden Warbler, Common Whitethroat, Willow Warbler, Spotted Flycatcher, Yellow Wagtail.

LEPIDOPTERA NOTES BRISTOL DISTRICT, 1966

BUTTERFLIES

By Derek J. Foxwell

THE following records have been given in detail except for some of the commoner species which are summarized. A card index noting full details including observations received too late for inclusion in this report is kept at The City Museum, Bristol.

1966 proved to be a good year for most species, especially *Vanessa cardui* L. (Painted Lady) which was observed in large numbers in most localities. Another interesting observation was that of *Euvanessa antiopa* L. (Camberwell Beauty), caught in a mercury vapour moth trap at Winscombe, Somerset, and later released. *Vanessa atalanta* L. (Red Admiral) and *Nymphalis io* L. (Peacock) were very plentiful during September, although only two records were received of *Colias croceus* Fourc. (Clouded Yellow).

Contributors were: R. Angles (R.A.), P. F. Bird (P.F.B.), A. Brown (A.B.), J. F. Burton (J.F.B.), R. M. Curber (R.M.C.), D. J. Foxwell (D.J.F.), P. L. Garray (P.L.G.), D. G. Gibb (D.G.G.), Miss E. Hurrell (E.H.), A. Kennard (A.K.), Mrs. M. Knight (M.K.), T. & M. Silcocks (T. & M.S.).

Unless otherwise stated, these records refer to adult insects. The area covered by this report is Somerset (**S.**), Bristol, and Gloucestershire (**G.**).

Pararge aegeria L. (Speckled Wood)

1966 was a good year as reports show this species to be numerous in many localities. The earliest records were: 2 specimens from both Shipham and Cheddar Wood on Apr. 30 (T. & M.S.); a male and female from Leigh Woods on Apr. 30 (D.J.F.); a few at Blagdon and Weston Wood on Apr. 30 (R.A.). One larva was observed at Coombe Dingle on Apr. 5 (A.B.). The first generation was once again fairly low, although the second at the end of August and during September was numerous. The latest record received was that of a single specimen from Shipham on Oct. 11 (T. & M.S.).

Pararge megera L. (Wall Brown)

Records suggest that this species was less common than in previous years. Numbers from any one locality were not more than six per day.

G. Filton: Aug. 15 and 18 (R.A.); Charfield: few on various dates, Aug. 14 to Sept. 16 (M.K.); Winterbourne: 1, June 4 (D.J.F.); Coombe Dingle: 2, Aug. 8 (A.B.).

S. Goblin Combe: 1, June 5 (A.B.); 6, May 29 (D.J.F.); Brockley Combe: 2, May 29; 4, June 8; 2, June 15 (D.J.F.); Velvet Bottom, nr. Charterhouse: 5, May 28 (T. & M.S.); The Mineries, nr. Priddy: 3, May 31 (D.J.F.); Walton Hill: 2, Aug. 10 (T. & M.S.); Sand Point: 5 observed resting on Sea Asters on Sept. 9 (T. & M.S.); Brean Down: 3, May 29 and Aug. 28, 6, Aug. 29 (R.A.).

Melanargia galathea L. (Marbled White)

This species still seems fairly numerous in its usual localities on the Mendips and elsewhere; however records indicate it to be less common than in 1964 and 1965.

G. Filton: Aug. 15 and 18 (R.A.); Almondsbury: few on July 16 (D.G.G.); Kingsweston Down: numerous on July 2 and 16, 1, Aug. 8 (A.B.); Damery: numerous, July 3 and 23 (A.B.); Wotton-under-Edge: numerous, July 23 (A.B.).

S. Oakford, nr. Bath: 1, July 10 (R.M.C.); Brockley Combe: few males on July 29, numerous males on July 2 and 3 (D.J.F.); Wrington Warren: numerous males and 6 females, July 7 (D.J.F.); Blagdon: 3, July 17 (T. & M.S.), several on July 24 (P.L.G.); Worlebury: 1, May 28 (J.A.), numerous on July 24, one still on the wing, Aug. 21 (T. & M.S.); Sand Point: 3, May 30, 3, Aug. 13 and 21 (R.A.); Cadbury Camp: numerous, July 14 (D.J.F.).

Eumenis semele L. (Grayling)

Only three records were received for 1966 as compared with six in the previous year. The usual habitat at Brockley Combe was searched, by D.J.F., during August with a negative result.

G. Michael Wood: 1, July 3 (A.B.).

S. Sand Point: 10, Aug. 13, also observed on July 31, Aug. 12 and 19 (R.A.); Brean Down: 4, Aug. 29 (R.A.).

Maniola tithonus L. (Hedge Brown)

Numbers appear to be rather low for 1966.

G. Tortworth: numerous, Aug. 2 (D G.G.); Rodway Hill: several, July 27 (P.L.G.).

S. Pill: one male in observer's garden on July 31, several on railway embankment by the viaduct in the village on Aug. 8, one in observer's garden on Aug. 18 and one female on Aug. 20 (J.F.B.); Cadbury Camp: numerous, July 14 (D.J.F.); Leigh Woods: 1 male, Sept. 3 (D.J.F.); Sand Point: recorded on July 17, Aug. 12 and 21, 15 on Aug. 13 (R.A.), 3 on Sea Asters on Sept. 4 (T. & M.S.); Sand Bay: 1, July 24 (R.A.); Worlebury: numerous, late July and during Aug. (T. & M.S.); Winscombe: one, Aug. 19, but not recorded at Shipham (T. & M.S.).

Maniola jurtina L. (Meadow Brown)

Once again this species was very numerous during 1966 both in **G.** and **S.** The first record was that of a few males from Brockley Combe and Goblin Combe on June 15 (D.J.F.); one specimen was also observed on the Avon Gorge on June 15 (A.B.).

Coenonympha pamphilus L. (Small Heath)

This species seems to be fairly widespread and numerous in most localities. Large colonies were observed at Cheddar, Wookey, Worlebury, Sand Point (T. & M.S.) and Charterhouse, Brockley Combe, Goblin Combe (D.J.F.).

G. Kingsweston Down: 1, July 2 and 16 (A.B.); Wotton-under-Edge: numerous, June 4 (D.J.F.), 1, July 23 (A.B.); Filton: numerous during June, few during September, last record, Oct. 4 (R.A.).

S. Walton Hill: numerous, May 29 (A.B.); The Mineries, nr. Priddy: few, May 31 (D.J.F.); Brean Down: 1, May 31 (R.A.); Shipham: 7, June 19 (T. & M.S.); Stock Hill, Mendip Forest: numerous, July 16 (J. F. B.); Chilton Moor and West Huntspill: numerous, July 24 (T. & M.S.); Chew Valley Lake: 3, Sept. 3 (M.K.).

Aphantopus hyperanthus L. (Ringlet)

Records were few with only small numbers observed on any one day in some localities, although large numbers were counted in certain Somerset areas.

G. Rodway Hill: 1, July 27 (P.L.G.); Charfield: 2, July 29, 1 on Aug. 23 (M.K.); Wotton-under-Edge: few, July 23 (A.B.); Damery: numerous, July 3, few on July 23 (A.B.).

S. Saltford: numerous, July 12 (A.B.); Blagdon Reservoir: 2, July 2 (R.A.); Weston Wood: 2, July 22 (R.A.); Oakford, nr. Bath: 1, July 11 (R.M.C.); Stock Hill, Mendip Forest: 1 very faded specimen, July 16 (J.F.B.); Brockley Combe: few, June 29, large colony on July 3 and 7 (D.J.F.); Cadbury Camp: few, July 10, numerous on July 14 and 16 (D.J.F.); Leigh Woods: numerous, July 9 (D.J.F.); Ebbor Gorge: 3, July 2 (T. & M.S.); Cheddar Wood: over 50 observed on the wing, July 10 (T. & M.S.); Shipham: the only records were of 2 on July 18 (T. & M.S.); Charterhouse: numerous, July 27 (T. & M.S.).

Argynnis selene L. (Small Pearl-bordered Fritillary)

Records for this species were very scarce except for one or two Somerset localities where large colonies were observed.

G. Michael Wood: 1, June 19 (A.B.).

S. Charterhouse: 4, June 26, none found on July 2 (T. & M.S.), numerous, July 3 (D.J.F.); Brockley Combe: few freshly emerged males, May 31 and June 1, numerous on June 8, large colony, both sexes, on June 15, numerous, but very worn, on June 29, few worn specimens on July 2, 3, 7 (D.J.F.); Goblin Combe: numerous, June 5 (A.B.), few, June 29 (D.J.F.).

Argynnis euphrosyne L. (Pearl-bordered Fritillary)

Very few records received for 1966.

G. Wotton-under-Edge: 1 female, June 4 (D.J.F.).

S. Goblin Combe: numerous, May 30, few on June 5 (A.B.), locally numerous, May 29, few on June 8 (D.J.F.); Brockley Combe: 9 fresh males, May 5, numerous on May 28, 29, 31, plentiful, but 70% badly worn, June 1 and 8 (D.J.F.).

Argynnis aglaia L. (Dark-green Fritillary)

This species seems to be fairly abundant in **S.** although no records were received from **G.**

S. Brockley Combe: 10 fresh males, June 29, large male colony on July 2 and 3, large colony of males plus 3 females, July 7 (D.J.F.); Charterhouse: 1 male, July 3 (D.J.F.), 1, July 2 (A.B.), 5, July 27 and 2 on Aug. 14 (T. & M.S.); Cheddar: 3, July 10 (T. & M.S.); Worlebury: 1, Aug. 21 (T. & M.S.); Brean Down: 2, July 10 and 24, 2 on Aug. 8 (R.A.); Sand Point: 2, Aug. 8 (R.A.); Cadbury Camp: numerous, July 14 and 16 (D.J.F.).

Argynnis cydippe L. (High Brown Fritillary)

S. Goblin Combe: 2, July 17 (A.B.).

Argynnis paphia L. (Silver-washed Fritillary)

G. Tortworth: 1, Aug. 2 (D.G.G.).

Euphydryas aurinia Rott. (Marsh Fritillary)

S. Charterhouse: numerous larvae, Apr. 29, few fresh males on May 31, 7 males on June 1 (D.J.F.), 1, July 2 (A.B.). This colony was notably much smaller than in previous years (D.J.F.).

Limenitis sibylla L. (White Admiral)

S. Nr. Bristol: 1, July 14 (D.J.F.).

Vanessa atalanta L. (Red Admiral)

This species appears to have been very abundant in most localities both in **G.** and **S.** Specimens were observed in Redland, Bristol, during September by P.F.B. It was counted in large numbers at Brean Down by R.A. who also reports a spectacular movement to the east of over 100 on Brean beach. Large numbers were also reported at Shipham during August and September by T. & M.S. 123 specimens were counted in two hours one afternoon in Leigh Woods on Sept. 3 by D.J.F. The last record was from Saltford, Oct. 16 (A.K).

Vanessa cardui L. (Painted Lady)

Many records were received of this immigrant from both counties. Large numbers were recorded, mainly flying in northerly directions, by most contributors. E.H. reports that many specimens were observed flying N.E. into the wind at Priddy on May 30. *V. cardui* was also very abundant at Brockley Combe where as many as 60 were counted in one day (D.J.F.). The last record was from Brean Down, Oct. 18 (R.A.). Numerous larvae were found on Thistles in a meadow near Clevedon, July 16 (D.J.F.).

Aglais urticae L. (Small Tortoiseshell)

Another favourable year with good records from most areas in the two counties. First records were 3 from Coombe Dingle, Mar. 5 (A.B.); 1 from Durdham Down, Mar. 16 (T. & M.S.); 1 at Sidcot and Winscombe, Mar. 8 (T. & M.S.). Both generations were large and broods of larvae could be seen on most patches of Stinging Nettles. Both generations were reported as being fairly large in the Pill area (J.F.B.). Specimens were observed in fairly large numbers in Bristol by most contributors. 15 were seen on Thistle flowers at Burrington Combe on Sept. 19 (P.F.B.).

Nymphalis io L. (Peacock)

Fairly numerous in most localities, the first records being from Shipham on Apr. 20 (T. & M.S.). Broods of larvae were observed at the Mineries, nr. Priddy, during July (D.J.F.) and at Stoke Bishop during July (A.B.). The second generation was fairly large with as many as 50 spotted in one day at Leigh Woods on Sept. 3 (D.J.F.). The last record was a single insect from Pill, Oct. 28 (J.F.B.).

Polygonia c-album L. (Comma)

Very few records of this species as compared with previous years.

G. Charfield: 1, Oct. 8 (M.K.); Filton Golf Course: 1, Oct. 13 (R.A.); Coombe Dingle: 12 during April and May, 1, July 3 (A.B.); Damery: 1, July 23 (A.B.); Durdham Down: few, July 22 (A.B.).

S. Leigh Woods: 1, Mar. 20 (E.H.), 2, Sept. 9 (D.J.F.); Bridgwater Road, nr. Bristol: 1 male, May 1 (D.J.F.); Oakford: 1, July 10 (R.M.C.); Shipham: 1 very worn specimen on Aug. 8, 1 fresh specimen, Aug. 18 and 19 (T. & M.S.).

Euvanessa antiopa L. (Camberwell Beauty)

The one record made of this species was from a mercury vapour moth trap at Winscombe on Sept. 25 by Mrs. E. Grubb, an experienced naturalist. There was fog at Winscombe on this particular night and visibility was down to 50 yards. Several records of butterflies at light have been published in recent issues of the Entomologist's Record, so this appears to be an interesting one.

Aricia agestis Schiff. (Brown Argus)

Few records of this species were received.

G. Stinchcombe: 2, Aug. 18 (D.G.G.); Wotton-under-Edge: 1, June 19 (A.B.).

S. Goblin Combe: numerous, June 5 (A.B.), few, June 15 (D.J.F.); Brockley Combe: 1, June 8, few on June 15 and 29, 1 on July 7, few on Sept. 11 (D.J.F.); Blagdon: 1, Sept. 10 (R.A.); Shipham: 1 male, May 30, 2 on Aug. 24, 2 on Sept. 5, 1, Sept. 16 (T. & M.S.).

Polyommatus icarus Rott. (Common Blue)

Numerous records indicate that this species is still plentiful in most localities, including Bristol.

G. Wotton-under-Edge: 1 female, June 4 (D.J.F.), 1, June 19 (A.B.); Kingsweston Down: 1, Aug. 8 (A.B.); Filton: 1, May 2, 1, June 10, 1 on Aug. 8, 2, Aug. 18, (R.A.); Stinchcombe: 1, Aug. 8, few on Aug. 17 and 18 (D.G.G.); Henbury Golf Course: 5, June 11 (A.B.).

S. Cadbury Camp: 1 male, June 8, 3 males, Aug. 28 (J.F.B.); Kewstoke: 1, May 1 (T. & M.S.); Shipham: 2, May 29, plentiful during June, 1 on July 7, more in August reaching peak of 14 on 24th, 6 on Sept. 3 and 5th, last seen, Sept. 20 (T. & M.S.); Cheddar Wood: 1, June 1 (A.K.), 1 female, Sept. 24 (P.L.G.); Charterhouse: 1 male, June 1, few on July 3 (D.J.F.); Brockley Combe: 1 male, May 31, 1 male on June 1, few on June 8, 15, 29 (D.J.F.); Goblin Combe: few, May 29, June 15 (D.J.F.), numerous on June 5 (A.B.); Brean Down: 1, May 31, 1, June 19, 3 on Aug. 29 (R.A.); Sand Point: 6, May 30, 3, Aug. 21, 1 on Aug. 13 (R.A.); Berrow: 2, Sept. 19 (R.A.).

Lysandra coridon Poda (Chalkhill Blue)

G. Henbury Golf Course: 1 larva, June 4 (A.B.); Wotton-under-Edge: numerous, July 23 (A.B.); Stinchcombe: 1 freshly emerged male, Aug. 8, few freshly emerged females on Aug. 18 (D.G.G.).

S. Uphill: 3, July 31, 2, Aug. 7 (R.A.); Brean Down: 2, Aug. 29 (R.A.); Walton Hill: 1, Aug. 10 (T. & M.S.); Windmill Hill: numerous, Aug. 10 (T. & M.S.); fairly numerous from late July until mid-Sept. in its usual haunts in North Somerset (D.G.G.).

Lysandra bellargus Rott. (Adonis Blue)

S. Chew Valley Lake: few pairs, Sept. 3 (M.K.).

Celastrina argiolus L. (Holly Blue)

The increased number of records this year may indicate that this species is becoming more plentiful. It was recorded in fairly large numbers at Stoke Bishop during May, July and August (A.B.). Also 3 were seen on Durdham Down during May (A.B.).

G. Damery: 1, July 23 (A.B.); Almondsbury: 1 female, May 15 (D.G.G.). Tortworth: few males, Aug. 2 (D.G.G.); Rodway Hill: 1, July 27 (P.L.G.).

S. Cheddar Wood: 1, May 14 and 30 (T. & M.S.); Shipham: 1, June, 1 on Aug. 10 (T. & M.S.); Cadbury Camp: 1, Aug. 8 (T. & M.S.); Pill: 1, May 7 and 15, 1 on July 14 (J.F.B.); Sand Point: 1, Aug. 14 (R.A.); Brockley Combe: 1 male, May 5 (D.J.F.); Goblin Combe: 1, July 17 (A.B.).

Cupido minimus Fuessl. (Small Blue)

S. Uphill: 1, July 31 (R.A.); Sand Point: 1, Aug. 13 (R.A.); Worlebury:

5, July 24, 3, July 29, 5, Aug. 7, 2 on Aug. 21 (T. & M.S.); a search was made at Shipham with a negative result—growth of Kidney Vetch very poor this year (T. & M.S.).

Lycaena phlaeas L. (Small Copper)

Locally abundant in **S.**, but very few records from **G.** On a regularly watched area at Shipham it was observed in fairly large numbers during May, June and August although only a single specimen was seen in July (T. & M.S.).

G. Wotton-under-Edge: 4, June 4 (D.J.F.); Coombe Dingle: 8 larvae in April, larvae abundant in Oct. (A.B.); Filton: 1, Aug. 26, larvae abundant in Oct. (A.B.); Stinchcombe: 1, Aug. 8 (D.G.G.); Almondsbury: 1, Sept. 7 (D.G.G.).

S. Pill: 2, Aug. 28, 1, Aug. 29 (J.F.B.); Brockley Combe: 1, May 28 and 31, 1, June 1, 2, June 15 (D.J.F.); Charterhouse: 2, May 28 and 31, 1, June 1 (D.J.F.); 1, July 27 (T. & M.S.); The Mineries: 2, May 31 (D.J.F.).

Callophrys rubi L. (Green Hairstreak)

G. Wotton-under-Edge: 1, June 4 (D.J.F.); Stinchcombe: numerous, Apr. 27 (A.B.).

S. Cheddar: 2, May 15, several on May 29 and 30, 1 on June 19 (T. & M.S.); Winscombe Hill: 1, May 30 (E.H.); Brockley Combe: numerous, May 5, 28, 29 and 31, June 1 and 8 (D.J.F.); Charterhouse: few, May 28 (D.J.F.); Goblin Combe: numerous, May 30 and June 5 (A.B.); Walton Hill: 3, May 29 (A.B.); Priddy: 1, May 29 (A.B.).

Thecla quercus L. (Purple Hairstreak)

Very few records were received this year with none from **G.** Observations suggest that *quercus* had a rather poor year during 1966.

S. Cheddar Wood: 1 on oak, July 16 (T. & M.S.); Walton Hill: 1 on ash, next to oak, Aug. 10 (T. & M.S.); Walton Hill: 1 larva, May 29 (A.B.); Brockley Combe: 6 larvae beat from young oak, June 1 (D.J.F.).

Strymonidia w-album Knoch (White Letter Hairstreak)

G. Coombe Dingle: 1, July 2 and 3 (A.B.).

S. Leigh Woods: 1 female pupa found on mature elm on June 12 (D.J.F.), 1, July 22 (A.B.); Goblin Combe: 1, July 10 (A.B.); Avon Gorge: 1, June 29, 1 on July 2 (A.B.).

Pieris brassicae L. (Large White)

Both broods recorded in large numbers from **G.** and **S.** The second brood seemed to reach its peak by mid-September, but observations were made up to the last week of October.

Pieris rapae L. (Small White)

Numerous in both **G.** and **S.** during the season from mid-April until the end of October.

Pieris napi L. (Green-veined White)

Once again this species had an extremely good year in both **G.** and **S.** Hundreds of specimens from the second brood were observed at Charterhouse and the Priddy area (D.J.F.).

Anthocharis cardamines L. (Orange-tip)

Another good year with this species being recorded in most **G.** and **S.** areas. Large numbers of ova and larvae were observed at Wotton-under-Edge, June 4 (D.J.F.). It was also recorded in moderate numbers at Coombe Dingle, Charterhouse and Walton Hill (A.B.). J.F.B. noted it to be common at Pill, May 15. A few specimens were observed at Shipham during late April (T. & M.S.).

Colias croceus Fourc. (Clouded Yellow)

Only two records were received of this species for 1966, although it was very numerous on the South Downs, nr. Seaford, Sussex (D.J.F.).

S. Chew Valley Lake: 1, Aug. 29 (R.M.C.); Shipham: 1 flew over lawn, Aug. 19 (T. & M.S.).

Gonepteryx rhamni L. (Brimstone)

A good year with many records from **G.** and **S.** Numerous larvae were found at Brockley Combe and Leigh Woods, but most had been attacked by parasites (D.J.F.). It was also recorded in Clifton (J.F.B.).

Erynnis tages L. (Dingy Skipper)

G. Wotton-under-Edge: few during May (D.J.F.).

S. Goblin Combe: few, May 29 and 31, numerous, June 15 (D.J.F.), numerous, May 30, June 5 (A.B.); Walton Hill: 8, May 29 (A.B.); Brockley Combe: few, May 5, 28, 29, 31, numerous on June 1, 8, 15, and July 2 (D.J.F.); Cheddar: 1, May 14, several on May 29 and 30; Shipham: 2, May 29, many on May 31, 2 on June 2 and 19. Many were chased relentlessly by Small Coppers (T. & M.S.); Charterhouse: few, May 28, numerous, June 1 (D.J.F.).

Pyrgus malvae L. (Grizzled Skipper)

G. Wickwar: 2, May 22 (A.B.).

S. Goblin Combe: numerous, May 30 and June 5 (A.B.), numerous, May 29 and June 8 (D.J.F.); Brockley Combe: numerous, May 5, 28, 29, 31, June 1, 8, 29, July 2 and 3 (D.J.F.); Charterhouse: few, May 28 and 31, 2 on June 1 (D.J.F.); few, May 28 (A.B.); The Mineries: few, May 31 (D.J.F.); Cheddar: 2, May 14 and 29, 3 on 30th (T. & M.S.).

Thymelicus sylvestris Poda (Small Skipper)

G. Tortworth: few, Aug. 2 (D.G.G.); Kingsweston Down: 1, July 2, numerous, July 16, few on July 21 (A.B.); Damery: numerous, July 3 and 23 (A.B.).

S. Goblin Combe: numerous, July 17 (A.B.); Brockley Combe: few, June 29, numerous on July 3 and 7 (D.J.F.); Stock Hill: numerous, July 16 (J.F.B.); Cheddar: 3, July 16 (T. & M.S.); Worlebury: numerous, July 24 and 29, Aug. 7 and 21 (T. & M.S.); Walton Hill: 3, Aug. 10 (T. & M.S.); Shipham: numerous from July 31 to Aug. 18 (T. & M.S.); Leigh Woods: numerous, July 9 (D.J.F.); Clevedon area: few, July 14 and 16 (D.J.F.).

Ochlodes venata Br. & Grey (Large Skipper)

G. Filton: 1, June 22 and 30 (R.A.); Michael Wood: numerous, June 19 and July 3 (A.B.); Wotton-under-Edge: 1, June 19 (A.B.); Kingsweston Down: numerous, July 3 (A.B.); Pilning: 1, July 9 (A.B.).

S. Pill: one pair in courtship display, June 26 (J.F.B.); Chew Valley Lake: 6, June 25 (T. & M.S.); Leigh Woods: 1, June 28 (T. & M.S.), few, July 9 (D.J.F.); Charterhouse: 6, June 26 (T. & M.S.), few, July 2 and 3 (D.J.F.); Brockley Combe: few freshly emerged males on June 1, few on June 8, 15, 29, July 3 and 7 (D.J.F.); Clevedon: few, July 14 (D.J.F.).

MOTHS

By K. H. Poole

ONCE again a poor year has been reported by most recorders, and with one or two exceptions migrants have been few. A very full list was received for Shipham, and as this is an area which has not featured very much in these notes, as many records as space allows have been included.

The following notes have been taken from records supplied by C. S. H. Blathwayt (C.S.H.B.), J. F. Burton (J.F.B.), D. J. Foxwell (D.J.F.), D. G. Gibb (D.G.G.), R. Haywood (R.H.), A. Kennard (A.K.), K. H. Poole (K.H.P.) and T. B. Silcocks (T.B.S.).

Unless otherwise stated single specimens have been recorded, and those taken at light marked by an asterisk.

Acherontia atropos L. (Death's-Head Hawk). Peasedown, Bath, Sept. 13, larva 'arrested' in garden of Police Station (J. E. Cooper).

Trichiura crataegi L. (Pale Oak Eggar). Shipham, Sept. 12* (T.B.S.).

Arctia villica L. (Cream-Spot Tiger). Almondsbury, May 30* (D.G.G.).

Colocasia coryli L. (Nut-tree Tussock). Leigh Woods, 2, June 11* (D.J.F.); Cheddar Wood, June 2* (A.K.); Shipham, July 27, Aug. 23* (T.B.S.).

Apatele alni L. (Alder Moth). Almondsbury, June 11* (D.G.G.); Leigh Woods, 2, June 11* (D.J.F.); Milton, Weston-s-Mare, June 6,* 12* (K.H.P.).

A. tridens Schiff. (Dark Dagger). Cheddar Wood, June 16 (A.K.); Chew Valley Lake, larva on hawthorn (T.B.S.).

Craniophora ligustri Schiff. (Coronet). Cheddar Wood, June 2, 29* (A.K.); Shipham, Aug. 5* (T.B.S.).

Amathes glareosa Esp. (Autumnal Rustic). Shipham, Sept. 8–Oct. 13* (T.B.S.).

Triphæna interjecta Hb. (Least Yellow Underwing). Shipham, July 21–Aug. 31* (T.B.S.).

Xylophasia remissa Hb. (Dusky Brocade). Shipham, July 2–Aug. 3* (T.B.S.).

Procus versicolor Borkh. (Rufous Minor). Cheddar Wood, June 16 (A.K.).

Antitype chi L. (Grey Chi). Shipham, Aug. 15–Sept. 18* (T.B.S.). Almondsbury, Aug. 20* (D.G.G.).

Apamea ophiogramma Esp. (Double Lobed). Shapwick, July 8* (C.S.H.B.).

Gortyna flavago Schiff. (Frosted Orange). Saltford, Sept. 14, 20* (A.K.); Shipham, Sept. 19–Oct. 8* (T.B.S.); Almondsbury, Sept. 26* (D.G.G.).

Leucania unipuncta Haw. (The White Speck). Shipham, Aug. 29, Sept. 5* (T.B.S.).

Laphygma exigua Hb. (Small Mottled Willow). Saltford, Aug. 10* (A.K.).

Cerastis rubricosa Schiff. (Red Chestnut). Bath, March 14* (R.H.).

Orthosia gothica L. (Hebrew Character). Saltford, June 14* (a very late date) (A.K.)

Zenobia retusa L. (Double Kidney). Shapwick, several, July and Aug.* (C.S.H.B.).

Parastichtis suspecta Hb. (Suspected). Shapwick, July 16,* several (C.S.H.B.).

Anchoscelis litura L. (Brown-Spot Pinion). Saltford, common, Sept. 14, 15, 16* (A.K.); Shipham, Sept. 21–Oct. 21* (T.B.S.).

Tiliacea citrago L. (Orange Sallow). Leigh Woods, Oct. 1* (D.J.F.); Saltford, frequent, Sept. 24 (A.K.).

Cirrhia gilvago Schiff. (Dusky Lemon Sallow). Shipham, Sept. 26* (T.B.S.); Saltford, Sept. 14, 24* (A.K.).

C. lutea Ström. (Pink Barred Sallow). Shipham, Sept. 27, 28* (T.B.S.).

Lithophane leautieri Boisd. (Blair's Pinion). Shipham, Oct. 14* (T.B.S.).

Polychrisia moneta Fab. (Golden Plusia). Shipham, July 21–Aug. 15* (T.B.S.).

Plusia festucæ L. (Gold Spot). Shipham, Aug. 18, 25, Sept. 7* (T.B.S.).

Lygephila pastinum Treit. (The Blackneck). Shapwick, July 8* (C.S.H.B.).

Tholomiges turfosalis Wocke (Marsh Oblique Barred). Shapwick, common, July and Aug.* (C.S.H.B.).

Pseudopterpna pruinata Hufn. (Grass Emerald). Charterhouse and Wookey, July 2 (T.B.S.).

Rhodometra sacraria L. (Vestal). Weston-s-Mare, Sept. 13* (Clive Hooper, per K.H.P.); Shipham, Sept 18, 19* (T.B.S.).

Ortholitha plumbaria Fab. (Lead Belle). Stock Hill, Mendip Forest, July 16 (J.F.B.); Charterhouse, June, July; Cheddar, July 3, 10 (T.B.S.).

Anaitis efformata Guen. (Lesser Treble Bar). Cheddar Wood, June 2 (A.K.).

Lampropteryx otregiata Metcalfe (Devon Carpet). Shapwick, May 21, 29*, several (C.S.H.B.).

Melanthia procellata Schiff. (Pretty Chalk Carpet). Shipham, July 5* (T.B.S.).

Pelurga comitata L. (Dark Spinach). Shapwick, July 8* (C.S.H.B.).

Perizoma taeniata Steph. (Barred Carpet). Shipham, Aug. 31* (T.B.S.).

Eupithecia succenturiata L. (Bordered Pug). Shipham, July 26, Aug. 3* (T.B.S.).

E. subumbrata Schiff. (Shaded Pug). Shapwick, June 10* (C.S.H.B.).

E. tenuiata Hb. (Slender Pug). Shapwick, July 16, 23*, common (C.S.H.B.).

E. innotata Hufn. (Angle-Barred Pug). Weston-s-Mare, Aug. 22* (C.S.H.B.); Shipham, July 4, 25, Aug. 10, 15* (T.B.S.).

Orthonama lignata Hb. (Oblique Carpet). Shipham, Sept. 8* (T.B.S.).

Nycterosea obstipata Fab. (The Gem). Weston-s-Mare, July 22* (C.S.H.B.); Leigh Woods, Oct. 1* (D.J.F.); Saltford, Sept. 25* (A.K.); Milton, Weston-s-Mare, Aug. 18* (K.H.P.); Shipham, Sept. 26, Oct. 9, 21* (T.B.S.).

Ectropis consonaria Hb. (Square Spot). Weston-s-Mare, 2, May 15* (C.S.H.B.).

Itama wauaria L. (V Moth). Shipham, July 21–Aug. 17* (T.B.S.).

Crambus genicuellus Haw. Saltford, Aug. 29* (A.K.).

C. uliginosellus Zell. Saltford, Aug. 28* (A.K.).

Ypsolophus alpellus Schiff. Saltford, July 31* (A.K.).

Y. scabriellus L. Saltford, Sept. 5* (A.K.).

Alispa angustella Hubn. Cheddar Wood, June 29 (A.K.).

Coleophora trigeminella Fuchs. Cheddar Wood, June 1. Larval cases on Ash (A.K.).

Phalonia hybridella Hb. Saltford, July 31 (A.K.).

Tortrix forsterana Fab. Cheddar Wood, June 2 (A.K.).

DISTRIBUTION OF MAMMALS IN THE BRISTOL AREA 1965-66

By Barbara E. Jones

INTRODUCTION

At the beginning of 1965 the Mammal Society of the British Isles organized a National Distribution Scheme for British Mammals. The main object of this scheme was to collect records, past and present, of British mammals on the basis of their presence in 10 km. squares of the National Grid.

Also early in 1965 a Mammal Section was formed within the Bristol Naturalists' Society. At the first meeting of this Section it was decided to participate in the National Distribution Scheme for British mammals but at the same time to attempt to plot their distribution in the Bristol area in much greater detail.

The area selected for coverage by the Bristol Naturalists' Society was bounded to the east by the grid line ST 70 and to the south by the grid line ST 50 and included all land to the west and north of these lines as far as the Bristol Channel coast. It was felt that this area would not seriously overlap with that studied by other local Natural History societies and included most of the land described in the only reasonably detailed account of mammals in the Bristol district published in recent years (Tetley, 1941).

The purpose of this paper is to give a preliminary report on the results of the first two years' recording.

Nearly all the records received have been the result of sightings of live or dead animals. Although some contributors are engaged in a survey of badger setts, very little other systematic surveying, trapping, or examination of the pellets of birds of prey has been carried out.

RESULTS

During 1965 a total of 262 records of mammals were received and in 1966 there were 378 records.

INSECTIVORA

	No. of records	
	1965	*1966*
Erinaceus europaeus (Hedgehog)	63	99
Talpa europaea (Mole)	14	19
Sorex araneus (Common Shrew)	4	8
Neomys fodiens (Water Shrew)	—	2

More records were received for *Erinaceus europaeus*, the Hedgehog, than for any other mammal. The well known response of this animal to unusual noise or apparent danger by rolling into a ball renders it particularly vulnerable to traffic accidents, and in fact most of the records relate to animals seen dead on roads. Animals, the size of a hedgehog, killed in this way are very easy to see and can be accurately identified often without more than a passing glance. This probably accounts for the fact that in spite of its largely nocturnal habits, the hedgehog is the only mammal so far recorded for every 10 km. square in the Bristol area (*see* Fig. 1).

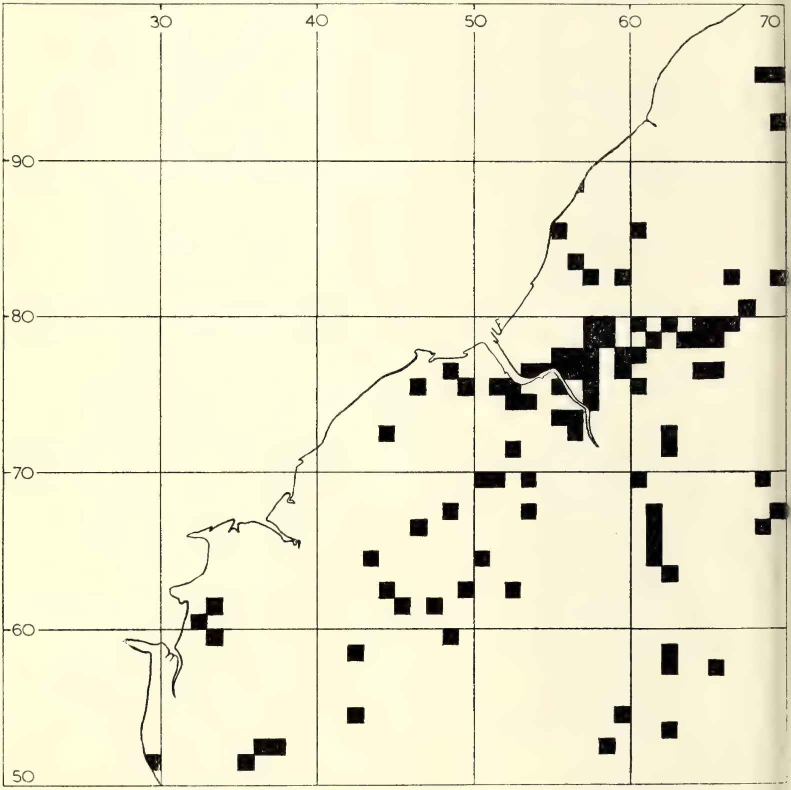

Fig. 1. *The Distribution of* Erinaceus europaeus (*Hedgehog*) *in the Bristol area, 1965-66.*

The symbol ■ represents at least one record within the sq. km.

Talpa europaea, the Mole, recorded mainly from fresh mole hills, appears to be common and widely distributed in the area.

Records for all the three species of shrew likely to be present are very few. Only 12 records were received for *Sorex araneus*, the Common Shrew, during the two years. Not a single record of *Sorex minutus*, the Pigmy Shrew, has been sent in, and only two records of *Neomys fodiens*, the Water Shrew, were received. Tetley (1941) stated that these three shrews were widely distributed and suggested that *S. araneus* was probably the commonest mammal in the district. There seems no reason to suppose that the lack of records in 1965 and 1966 in any way represents a scarcity of shrews in the area.

CHIROPTERA

	No. of records	
	1965	*1966*
Myotis mystacinus (Whiskered Bat)	1	1
Myotis nattereri (Natterer's Bat)	–	1
Nyctalus noctula (Noctule)	1*	1*
Pipistrellus pipistrellus (Pipistrelle)	1	1

* Flight record only.

Very few bat records have been received. Tetley (1941) recorded 9 species, only 4 of which have been recorded in 1965-66.

LAGOMORPHA

	No. of records	
	1965	*1966*
Oryctolagus cuniculus (Rabbit)	19	37
Lepus europaeus (Brown Hare)	11	12

During the mid 1950's myxomatosis caused a severe reduction in the numbers of *Oryctolagus cuniculus*, the Rabbit, throughout Britain (Thompson & Worden, 1956). Since then numbers have recovered to some extent in spite of repeated sporadic outbreaks of the disease and more systematic efforts at control (Thompson & Worden, 1956; Andrewes, Thompson & Mansi, 1959). The rabbit is generally considered to have a wide distribution in rural parts of the Bristol area and a systematic effort to obtain records would probably give a more accurate picture of its distribution than is at present shown in Fig. 2.

Similarly *Lepus europaeus*, the Brown Hare, is almost certainly more widely distributed than present records show.

RODENTIA

	No of records	
	1965	*1966*
Sciurus carolinensis (Grey Squirrel)	27	29
Clethrionomys glareolus (Bank Vole)	–	8
Microtus agrestis (Short-tailed Vole)	1	4
Arvicola amphibius (Water Vole)	12	28
Apodemus sylvaticus (Long-tailed Field Mouse)	7	11
Apodemus flavicollis (Yellow-necked Mouse)	1	1
Micromys minutus (Harvest Mouse)	1	–
Mus musculus (House Mouse)	12	8
Rattus rattus (Ship Rat)	1	1
Rattus norvegicus (Common Rat)	29	19
Muscardinus avellanarius (Dormouse)	1	–

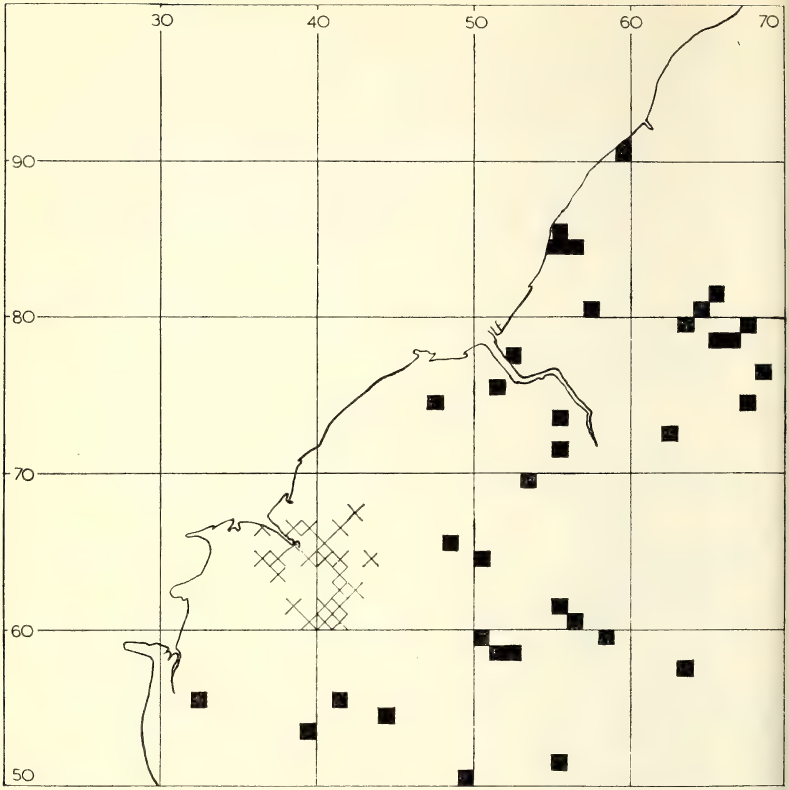

Fig. 2. *The Distribution of* Oryctolagus cuniculus (*Rabbit*) *and* Mustella vison (*American Mink*) *in the Bristol area, 1965-66.*

The symbols represent at least one record within the sq. km. of *O. cuniculus* (■), and *M. vison* (X).

One of the major changes that has occurred in the mammalian fauna of the area since Tetley described it is the complete disappearance of *Scuirus vulgaris*, the Red Squirrel, and its replacement by *Scuirus carolinensis*, the Grey Squirrel. This animal is now common and widely distributed throughout Somerset and Gloucestershire.

The inconspicuous habits of the rats, mice and voles probably account for the paucity of records of many of these animals. The two separate records for *Apodemus flavicollis*, the Yellow-necked Mouse, one in 1965 from Rodney Stoke Woods in the Mendips and one in 1966 from Leigh Woods, were both obtained as the result of trapping. The single records of *Muscardinus avellanarius* (Dormouse) from near Clevedon and *Micromys minutus* (Harvest Mouse) from near Wrington are interesting and suggest that investigation might reveal a more widespread distribution of these species.

Rattus rattus, the Ship Rat, is known to be present in the Bristol and Avonmouth area (Bentley, 1964) and one record for Bristol was received in each year. Although Flatholm is outside the area of this local survey it is interesting to note that a colony of *R. rattus* existed there in 1962 and 1963 (J. D. R. Vernon, *pers. comm.*) and the species may still be present on the island.

CARNIVORA

	No. of records	
	1965	*1966*
Vulpes vulpes (Fox)	16	31
Mustella erminea (Stoat)	3	11
Mustella nivalis (Weasel)	6	5
Mustella vison (American Mink)	19	16
Meles meles (Badger)	12	25

No records were received for *Martes martes* (Pine Marten), *Mustela putorius* (Polecat), and *Lutra lutra* (Otter).

Records for *Vulpes vulpes* (Fox), *Mustella erminea* (Stoat), *Mustella nivalis* (Weasel), and *Meles meles* (Badger), though not very numerous, suggest a wide distribution.

One of the most interesting changes in the mammalian fauna of the area has been the appearance of *Mustella vison*, the American Mink. The first record of this species for Somerset was in 1962. Since that time it has appeared in increasing numbers in the county. Trapping was started by the Ministry of Agriculture, Fisheries and Food in 1965 and the records of mink distribution shown in Fig. 2 are taken from the Ministry's records. So far no reports of feral mink have been received from that part of Gloucestershire covered by this survey.

ARTIODACTYLA

No records have been received for any species of deer.

Obviously the numbers of records received during 1965 and 1966 are too few for any final conclusions to be made about the numbers and distribution of mammals in the Bristol area. The scarcity or complete absence of records for some species known to be common —notably the shrews and smaller rodents—indicates that some method rather than casual sightings of live or dead animals is necessary to obtain definite information of their distribution. Systematic trapping of selected areas, examination of the pellets of birds of prey, and a survey of remains in discarded bottles (Morris & Harper, 1965) would help to fill some of the gaps.

It is hoped that when recording has been continuous for 5–10 years a more complete picture of the distribution of the mammals of the Bristol district will be available.

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STUDIES ON THE BIRDS OF PREY OF THE BRISTOL DISTRICT

I. INTRODUCTION

By G. Sweet

THE Ornithological Section's Bird of Prey Study was inaugurated in 1964 on the initiative of a small group of B.N.S. members with a special interest in the raptors. In that year, the British Trust for Ornithology and the Nature Conservancy carried out a national enquiry into the breeding season status of the Kestrel, Tawny Owl and Barn Owl, using the 10 km. squares of the National Grid as a basis for recording (Prestt and Bell, 1966). The Section took part in this enquiry, and the opportunity was taken to launch a detailed local study, which would cover all seasons over a term of years, and deal with a wider range of species.

A series of reports is planned to deal with specific topics. The first one, on the breeding season status of the Kestrel, follows this introduction which outlines the aims and methods of the studies. These set out to obtain information on as many aspects as possible concerning the local populations of Buzzard, Sparrowhawk, Kestrel, Barn Owl, Tawny Owl and Little Owl, and to determine the status of the less common species.

Two of the aspects which are being investigated call for particular comment. The first is the size of the local populations at different seasons. Experience with other species shows that a general term such as 'common' can cover widely different numbers, and that subjective impressions are an inadequate basis for precise statements about status—they may indeed fail to reveal substantial changes. The task here is to provide as firm a numerical assessment as possible; the importance of this, even for the commoner birds of prey, was stressed by Prestt and Bell (1966). In this district these birds do not seem to have been seriously affected by chemical contamination of the environment, as they have been elsewhere, and the present studies will therefore provide both a datum for future work here and a useful comparison with other areas.

The second noteworthy aspect being studied is the hunting range of the various species, its size and its variation from day to day and season to season. This is a subject on which, for these species, there appears to be no sufficiently precise information in the British literature except Southern's (1954) study of the Tawny Owl. We use the expression 'hunting range' in the same sense as Craighead and Craighead (1956), to describe the area over which an individual bird, or a pair, habitually hunts during a given period. It is not in general defended against incursions by other members of the same species, and so must be distinguished from 'territory,' defined by Noble (1939) and Nice (1943) as 'any defended area.'

The methods of study fall into three categories:

(*A*) The most extensive, and the least specialized, is the recording of 'casual' encounters, often made while travelling. The minimum useful information about such a sighting is the species, number of birds, place (specified as accurately as possible) and date. Records are kept on edge-punched cards, to ease sorting according to locality, month, year, the nature of the bird's activity, and the precision with which the locality was indicated. Any other data, such as time of day and weather details, are also recorded on the cards. Many observers contribute information in this category, especially for Kestrel and Tawny and Little Owls.

(*B*) This category calls for more precise information. Forms have been devised to record for each observation the date, time, weather, sex (when distinguishable), and the activity of the bird or birds; the forms are supplemented where necessary by sketch maps. Individual birds can sometimes be distinguished by plumage characteristics such as state of moult or colouration, and then more detailed information on behaviour can be gathered, including the interaction of individuals with one another. Fewer observers participate at this level, which demands both skill and patience. A valuable feature is that some localities are surveyed regularly, so that the work, although less extensive, is more intensive than that in category *A*.

(*C*) The third method consists of concentrated and prolonged studies of particular pairs of birds or of very limited areas. The object is primarily to record in detail the hunting range and behaviour, and as this necessarily involves lengthy periods of observation the study is still more intensive and less extensive, and fewer individuals take part in this than in (*A*) and (*B*). Large-scale maps are the main medium for recording and primary analysis.

The work in categories *B* and *C* includes the methodology of field observation. By developing suitable observing techniques, which take into account the topography, weather, time of day and other variables, the value of the time spent in the field has been considerably increased.

These three categories overlap to some extent. Casual sightings accompanied by details of weather etc. contribute substantially to *B;* repeated visits to the same area made in category *B* contribute to *C;* and both *B* and *C* contribute data of type *A*, in which form the information is most easily used for some purposes. This is exemplified in the following part, in which the main analysis depends on plottings of type *A* data, although the interpretation rests also on more precise studies.

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II. BREEDING SEASON STATUS OF THE KESTREL

By S. M. Taylor

Davis (1947) gave the local status of the Kestrel, *Falco tinnunculus*, as 'Resident. Common and widely distributed.' Reporting on the national Small Predator Enquiry, Prestt (1965) rated it as 'common' in the whole S.W. peninsula, including Gloucestershire. For the change in its breeding status between 1953 and 1963 his rating was 'slight decrease'. These ratings were derived from subjective assessments made by a large number of experts with a detailed knowledge of their localities. As to the slight decrease, we have no precise evidence for the Bristol District, although any change which may have occurred is certainly much smaller than the decrease which has taken place over the same period in eastern England. The present breeding season status can, however, be described fairly precisely following the first three years' work of the Bird of Prey Study.

THE DATA

The area to which the present investigation relates is shown in Fig. 1. It follows no administrative boundaries, but is the largest continuous area considered to be adequately covered by the

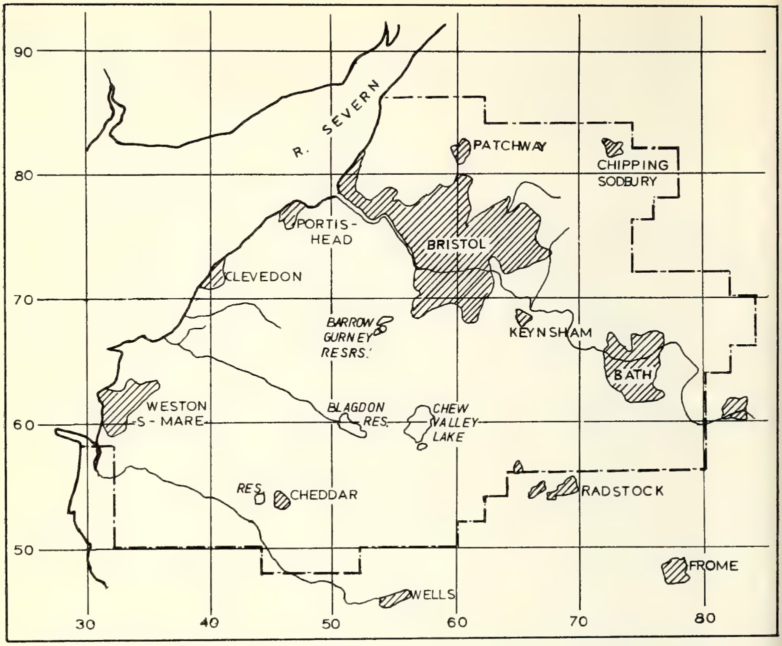
90
80
70
60
50
R. SEVERN
PATCHWAY
CHIPPING SODBURY
PORTISHEAD
BRISTOL
CLEVEDON
BARROW GURNEY RESRS.
KEYNSHAM
BATH
WESTON -S - MARE
BLAGDON RES.
CHEW VALLEY LAKE
RES.
CHEDDAR
RADSTOCK
FROME
WELLS
30
40
50
60
70
80

Fig. 1. *Sketch map of Study Area (boundary chain-dotted).* The 10 km. grid lines of part of the National Grid square ST are shown, and the main built-up areas are shaded.

observations. For convenience, it has been delimited by even-numbered kilometre lines of the National Grid. It covers 1308 sq. km., of which the majority lies in N. Somerset, and it includes the built-up areas of Bristol and Bath and their suburbs. These, together with Weston-s-Mare, Clevedon, Portishead and the larger villages, are estimated to cover 140 sq. km., leaving 1168 sq. km. (450 sq. miles) of potential Kestrel terrain. (Although Kestrels have bred in the heart of the city of Bristol, it is not thought that any did so during the period here discussed; the location and incidence of the fifty or so sightings over the City suggest that they were of birds resident outside the built-up area.) In deriving the above figures, no allowance was made for the water surface of the reservoirs.

Kestrel observations of all three categories described in Part I have been used, attention being confined to the months of April to July, and 756 reports were available, roughly equally distributed among the three years. The number of actual sightings is substantially in excess of this, as an appreciable proportion of reports is of birds seen regularly over a period. The presence of several breeding pairs in the vicinity of Chew Valley Lake, combined with the high concentration of birdwatchers there, produced over 200 reports. The situation was clarified by Category *B* studies made by D. Warden. Similar complications at another site were resolved in the same way by R. M. Curber.

THE ANALYSIS

The method used will be described in some detail for future reference. Each year all breeding season sightings were plotted, on a scale of 4 km. to one inch, using National Grid co-ordinates supplied by the observers or deduced from their locality descriptions; the months were distinguished by separate symbols. Most of the observations fell into more or less well-defined clusters, and these were ringed on the map. Caution was exercised in this operation—if there was doubt as to the existence of a cluster, it was not marked. A condition for the marking of a cluster was that at least three of the four months, or March and two of them, had to be represented in it.

Field studies made in the localities of typical clusters showed them to be occupied by resident pairs of Kestrels. In other cases, the same deduction could be made from the details given by observers (showing, e.g., the presence of birds of both sexes, or of juvenile birds at the end of the period). Also, in eighteen cases over the period, clusters were found to be associated with known nest sites. It was therefore assumed that each cluster could be taken to represent a resident pair of birds—a conclusion strengthened by the permanence from year to year of nearly all the clusters, discussed below.

At the end of the three years, a composite plot of the data was constructed, and the tentative cluster boundaries were transferred to it. By making minor adjustments it was possible in all but sixteen of the 56 cases to produce cluster boundaries containing all three years' plottings of sightings. In fourteen of the remaining cases, two years were represented; two of these cases referred to sites where regular observations had been made in two years, but not in the third—no allowance has, however, been made for this. In the final two clusters only 1966 was represented, and the details suggested a shift from an adjoining or partly overlapping area belonging to the fourteen just discussed.

Taking these sixteen cases into account, the final inference is that there were 52 clusters of observations in 1964, 48 in 1965 and 50 in 1966, in the area in question. On the assumption that each represents a resident pair, the average figure of 50 corresponds to a density over the rural area of one pair per 23.4 sq. km. (9 sq. miles). The somewhat lower estimate published in *Proc. B.N.S.*, 1964, p. 43, did not allow for built-up areas and was based on less complete data.

The clusters were uniformly distributed over the whole rural terrain, except for seven or eight areas, in each of which there was room for a cluster of typical size. If hypothetical clusters were inserted, and if all the 56 observed during the three years were assumed to be occupied each year, an absolute maximum of 64 pairs would be arrived at, equal to one pair every 18 sq. km. (7 sq. miles).

CONCLUSIONS

An analysis of 756 reports of Kestrel sightings in the months April to July, 1964 to 1966, over an area of 1168 sq. km. of rural terrain in N. Somerset and S. Gloucestershire, leads to an estimate of about one resident pair per 23 sq. km., almost uniformly distributed. An upper bound to the density, very unlikely to be realized, is one pair per 18 sq. km.

ACKNOWLEDGMENTS

Acknowledgment is due to the large number of members who have contributed records regularly or casually. The special part played by Messrs. R. M. Curber and D. Warden has already been mentioned. I am grateful to H. R. Hammacott and N. G. M. Taylor for substantial assistance with fieldwork and with the sorting and plotting of records, respectively.

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THE VEGETATION OF CATCOTT HEATH, SOMERSET

By A. J. Willis

(Department of Botany, University of Bristol)

INTRODUCTION

THE extensive low-lying parts of Somerset known as the Levels include a substantial tract, South Marsh, between the Mendip and Polden Hills. The area of South Marsh referred to as the Turf Moor, lying west of Glastonbury and extending to Edington, is a complex of fen and bog and includes many of the peat 'Heaths', which have long been known as sites of great interest for their plant and animal life. Catcott Heath is one of a sequence of these, and lies west of the large Shapwick Heath and near to the western margin of the peat, indicated approximately by the Burtle Sands, deposits which may represent a former coast-line.

The vegetation of the lowland areas was first described in some detail by Moss (1907), and an account of the plant communities of Shapwick Heath and of the ecological factors operative there has been given by Hope-Simpson, Newton and Ricketts (1963). Although a number of notable plant records have been made for Catcott Heath (White, 1912), the information is scattered; in the present paper an attempt is made to give a more complete account of the plants, in particular of one enclosure ('Ten Acre', adjoining Higher Ropes Drove, and here referred to as the Marsh Pea enclosure) which supports a rich vegetation in which several species now very rare on the peat moors occur in quantity. The area (National Grid Ref. ST/405414) is of special interest because of this assemblage of plants, some of which were known formerly to be much more widespread on the Turf Moor; it is probable that the vegetation of parts of this Heath may resemble that once common in the peat moors but which is being progressively replaced as a result of man's activities. Very substantial changes have taken place because of peat cutting and gradual lowering of the water table in the last century, and further change is likely, particularly if drainage schemes lead to even lower water tables. It therefore seems desirable to put the present vegetation on record, especially as it is probably the best remaining example of a fen community in the Somerset Levels.

Most of the field work reported in this paper was carried out in 1963 and 1964.

THE CONDITIONS FOR PLANT GROWTH

Catcott Heath is one of the most low-lying parts of the Turf Moor. Moss (1907) quotes its altitude as 10 feet above Ordnance Datum and White (1912, p. 616) describes part of the area as " . . . a very wet swamp of considerable extent—possibly, in part a primitive morass—and is unapproachable, even in a dry season, without a little wading." Although the altitude of much of the area is not substantially different from that noted by Moss, the ground is considerably drier than formerly, no doubt as a result of the improved drainage of the Levels. Nevertheless, the water table is close to the peat surface (in late May 1964 about 1 foot below), and the peat above the water table can hold five or more times its dry weight of water.

Such a low-lying site as Catcott Heath is liable to be flooded by water fairly rich in mineral salts, notably calcium, of which the principal source is ultimately the carboniferous limestone of Mendip. Fen conditions consequently result, with pH values near to neutrality, and high mineral content of the peat. An indication of fairly eutrophic conditions is given by the rather high ash contents of the peat, which were found to vary from 11.5% to 17% of the dry weight. An average of three estimations made at a depth of 1–2 inches in the Marsh Pea enclosure was 12.6%, and at a depth of 3–4 inches was 14.8%. These ash contents are similar to those of most of the peat profile developed under fen conditions in the Gordano valley (Willis & Jefferies, 1959), but a little lower than reported (20%) for reedswamp and *Carex* fen peats by Gorham (1961). The low ash contents of *Sphagnum* and other bog peat (where the values are commonly 1–4%) are, however, in very strong contrast.

THE VEGETATION OF THE MARSH PEA ENCLOSURE

This enclosure is some 10 acres (4 ha.) in extent. As already noted, it is of special interest because of its assemblage of plants, a number of which are local and rare on the peat moors as a whole, but quite plentiful in the present site.

Most of the enclosure bears a complete cover of fairly tall herbaceous plants, but clumps of *Salix cinerea* ssp. *atrocinerea*, with some *Alnus glutinosa*, *Betula pubescens*, *Crataegus monogyna*, *Myrica gale*, *Rosa canina*, *Rubus* spp. and *Viburnum opulus*, are also present. The dominant plants are *Molinia caerulea*, *Juncus subnodulosus*, the Marsh Fern

Thelypteris palustris and the Water Horsetail *Equisetum fluviatile.* A number of other species comprise a substantial part of the flora, however, as indicated in Table 1, where the relative bulk of the chief components is shown. Assessments of the whole enclosure were made subjectively by the procedure described by Willis, Folkes, Hope-Simpson and Yemm (1959). Nomenclature of higher plants follows that of Clapham, Tutin and Warburg (1962), of mosses that of Warburg (1963) and of liverworts that of Paton (1965). The very plentiful *Juncus subnodulosus* is a good indicator of eutrophic conditions, but some of the widespread species, such as *Filipendula ulmaria,* are also components of showy "mixed fen" vegetation.

Table 1. The chief species of the Marsh Pea enclosure.

The figures give percentage relative bulk of the major components of the vegetation, assessments being made in late May, 1964, when the vegetation was about 15 inches tall. Species not listed represented less than 1% of the total bulk of the vegetation.

Bare ground	1	Carex lasiocarpa	1
Juncus subnodulosus	20	C. panicea	1
Molinia caerulea	20	C. riparia	1
Equisetum fluviatile	15	Cladium mariscus	1
Thelypteris palustris	15	Iris pseudacorus	1
Filipendula ulmaria	8	Lathyrus palustris	1
Thalictrum flavum	5	Lythrum salicaria	1
Carex rostrata	2	Peucedanum palustre	0.5
C. disticha	1		

Three areas within the enclosure dominated by different species were studied and values of pH of the peat of these localities estimated by means of a glass electrode. The results are given in Table 2, from which it is seen that although there is variation from site to site in some of the most abundant plants the range of pH values is rather small. At the surface the conditions are close to neutrality but tend to be slightly more acidic at depths of 3–4 inches.

The flora of the enclosure is diverse, over 100 species of flowering plants being recorded, and some 20 species of Bryophytes. Table 3 shows the less frequent members of the flora; many components typical of fen communities are seen to be represented. A very small, drier, grazed pasture to the east bears flora of a somewhat different kind, comparable to the communities at some parts of the edge of the Marsh Pea enclosure where normally no grazing occurs. It may be noted that in an adjoining rhine is one of the last surviving patches of *Ranunculus lingua* on the moors.

Table 2. The major components of the vegetation and pH values of three sites in the Marsh Pea enclosure.

Site 1		Site 2	
Cladium mariscus		Molinia caerulea	
Lathyrus palustris		Thelypteris palustris	
Molinia caerulea		Thalictrum flavum	
Thelypteris palustris		Juncus subnodulosus	
Filipendula ulmaria		Carex lasiocarpa	
Lythrum salicaria		C. disticha	
Carex disticha		C. rostrata	
pH at 1–2″	6.26	pH at 1–2″	6.74
3–4″	6.26	3–4″	6.38

Site 3		
Juncus subnodulosus		
Equisetum fluviatile	pH at 1–2″	6.45
Filipendula ulmaria	3–4″	6.06
Thalictrum flavum		

Of special interest is the occurrence of the Great Fen Sedge, *Cladium mariscus*, in the enclosure. This plant was once common in the Somerset Levels, its remains being abundant in the eutrophic fen peat which developed above the *Phragmites* peat (which formed in the Atlantic Period some 6,000 years ago) on the clay floor of the Levels. *Cladium* is also plentiful in the more recent peat of early Sub-atlantic age, developed following widespread flooding as a result of the wetter climate at the end of the Sub-boreal Period (Clapham & Godwin, 1948). At that time water rich in bases flooded much of the peat moors converting the oligotrophic bogs to fens, and leading to conditions which favoured the growth of *Cladium mariscus*, characteristic of calcareous sites where the water is not too deep (Conway, 1938). *Cladium* is now very rare in Somerset, being extinct in the Gordano valley (Willis & Jefferies, 1959), and extremely restricted in the peat moor area. The plant was noted by W. Sole in his manuscript Flora of Somerset, 1782, for "Burtle moor," but was not known on the Turf Moors by Clark (1858). It was, however, rediscovered at Catcott Burtle by Corder in 1910 (White, 1912). White records that a ". . . solitary clump, four or five feet across, . . . survives," but the patch has increased in size since then. Several smaller clumps now exist and occasionally flower; the time of their formation is, however, unknown.

The Marsh Pea, *Lathyrus palustris*, plentiful and widespread in the enclosure, where it may climb on willow to a height of 7 feet, is very

Table 3. Less abundant species of the Marsh Pea enclosure.

Angelica sylvestris
Caltha palustris
Calystegia sepium
Cardamine pratensis
Carex hostiana
C. nigra
Cirsium dissectum
Dactylorhiza fuchsii
D. incarnata
D. praetermissa
Epilobium hirsutum
E. obscurum
Eriophorum angustifolium
Galium palustre
G. uliginosum
Holcus lanatus
Hydrocotyle vulgaris
Hypericum tetrapterum
Hypochoeris radicata
Juncus acutiflorus
Lotus pedunculatus
Lychnis flos-cuculi
Lycopus europaeus
Lysimachia nummularia
L. vulgaris
Mentha aquatica
Menyanthes trifoliata
Oenanthe fistulosa
Ophioglossum vulgatum
Osmunda regalis
Pedicularis palustris
Phalaris arundinacea
Poa pratensis
Polygonum amphibium (terrestrial form)
Potentilla anserina
P. palustris
Prunella vulgaris
Ranunculus acris
R. flammula
Rhinanthus minor
Rumex acetosa
Scutellaria galericulata
Sium latifolium
Stachys palustris
Stellaria palustris
Taraxacum officinale
T. palustre
Valeriana dioica
V. officinalis
Vicia cracca

In rhines

Alisma plantago-aquatica
Hottonia palustris
Hydrocharis morsus-ranae
Lemna minor
L. trisulca
Oenanthe aquatica
Rumex hydrolapathum
Sparganium erectum
Typha latifolia

At edge and drier pasture to east

Agrostis stolonifera
Anthoxanthum odoratum
Briza media
Carex flacca
C. hirta
Cerastium holosteoides
Cirsium arvense
C. palustre
C. vulgare
Dactylis glomerata
Eupatorium cannabinum
Festuca arundinacea
Geranium dissectum
G. robertianum
Glyceria maxima
Poa trivialis
Potentilla erecta
Ranunculus repens
Solanum dulcamara
Sonchus asper
Stellaria graminea
Succisa pratensis
Urtica dioica

rare in S. England. Typically a plant of wet peat bogs, its distribution appears to be becoming increasingly restricted both on the Somerset moors and also in Britain as a whole. Drainage of suitable sites for the plant is no doubt an important factor here.

Another plant, quite abundant in the Catcott Heath enclosure, but rare in S. England, is *Carex lasiocarpa*, recently discovered in the area, but known also on Shapwick and Street Heaths.

Although the rare plants mentioned above are well established components of the flora of the enclosure, together with the many other species typical of fen or "mixed fen," a substantial number of plants known by Sole on "Burtle moor" appear to be extinct. Losses in the flora in this locality almost certainly include Cowbane, *Cicuta virosa*, and *Hypericum elodes;* Sole notes *Parnassia palustris* "in old pits on Burtle moor" (Clark, 1858), but this record has never been confirmed.

Table 4. Bryophytes of the Marsh Pea enclosure.

On ground

Acrocladium cordifolium
A. cuspidatum
Brachythecium rutabulum
Bryum capillare
B. pseudotriquetrum
Campylium stellatum
Drepanocladus fluitans
Eurhynchium praelongum
Fissidens adianthoides
Mnium affine agg.
M. punctatum

Epiphytes (*on willow*)

Cololejeunea minutissima
Frullania dilatata
Lophocolea heterophylla
Metzgeria furcata
Amblystegium serpens
Hypnum cupressiforme var. cupressiforme
H. cupressiforme var. filiforme
Ulota crispa

Of interest in the Bryophyte flora (Table 4) of Catcott Heath is the fair number of epiphytes; these thrive in the somewhat damp and unpolluted atmosphere. The extremely small liverwort *Cololejeunea minutissima* is known in N. Somerset only from this locality where it occurs (bearing sporangia, androecia, and discoid gemmae) together with *Frullania dilatata* and other epiphytes on willow.

SUMMARY AND CONCLUSIONS

Catcott Heath, towards the western limit of the Somerset Turf Moor, bears vegetation developed under eutrophic, near neutral, conditions on peat which lies very close to the water table. Typical fen plants are well represented in a diverse flora in which several species of rare and local distribution (*Cladium mariscus*, *Lathyrus palustris*, *Carex lasiocarpa*) are notably abundant. Further studies are however, needed to elucidate the ecosystem more fully, including the habitat conditions and their effects on these and other plants. Although conservation of the existing habitat is highly desirable, drainage conditions of the area may alter as a result of a lowered water table elsewhere; any such differences must lead to changes in the vegetation of which a record and analysis would be valuable.

ACKNOWLEDGMENTS

Many of the studies reported here were undertaken jointly with the late N. Y. Sandwith to whom I am much indebted. I am very grateful to Mrs. J. Appleyard, who confirmed the naming of nearly all of the Bryophytes, and to P. J. M. Nethercott for comments on the manuscript.

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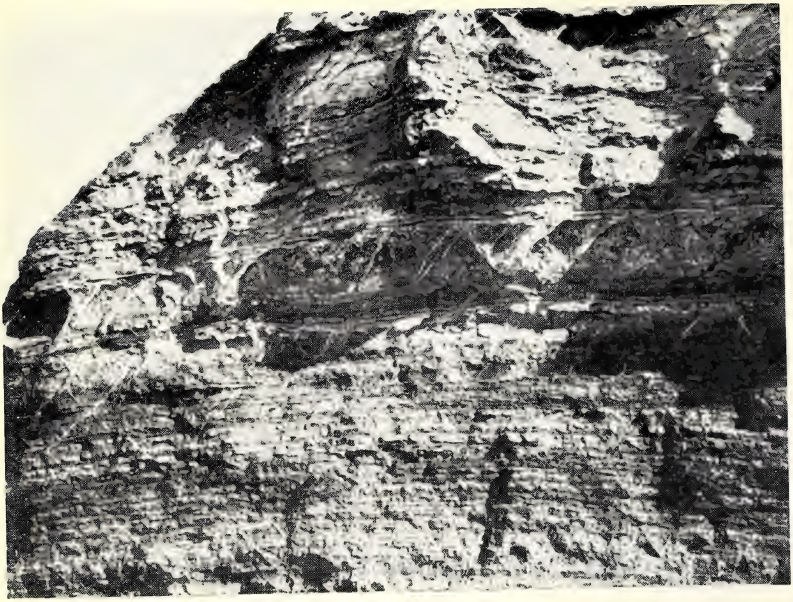

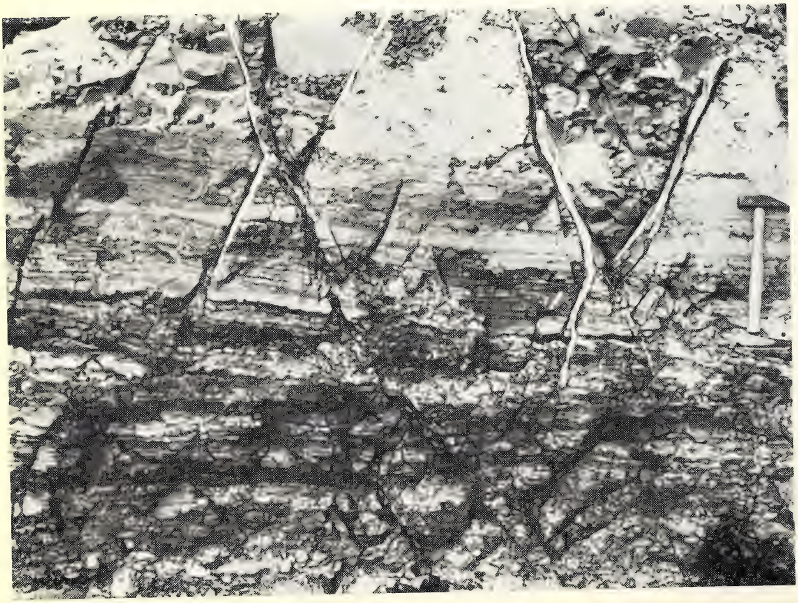

Upper: Gypsum veins across the gentle anticline at Blue Anchor Point.
Lower: Offset conjugate gypsum veins.

CONJUGATE GYPSUM VEINS AT BLUE ANCHOR POINT, SOMERSET

By R. Bradshaw and D. Hamilton

(Department of Geology, University of Bristol)

THE Triassic, Rhaetic and Liassic rocks at Blue Anchor Point (ST038437), described in detail by Richardson (1911), are disposed in a gentle anticline with an almost horizontal axis trending about 100°. Well developed sets of intersecting gypsum veins form a conspicuous feature of the cliff face (Pl. VII, upper) and the relation of these conjugate veins to the anticline is the subject of this paper.

Gypsum is abundant in the Tea Green Marls and the overlying Sully Beds which vary in lithology from finely laminated, dark grey, sandy mudstones to massive, onion-weathering, dark green siltstones. It occurs in three quite distinct forms: (1) nodules of pink or whitish, coarse grained alabaster, occurring essentially in the laminated mudstones and at the base of the massive beds; (2) thin veins of white, finely fibrous satin spar, more or less parallel to the bedding; (3) the conjugate veins of pink satin spar. These forms however are not found in the overlying incompetent Rhaetic shales. The general relationships of these three types are shown in Fig. 1a.

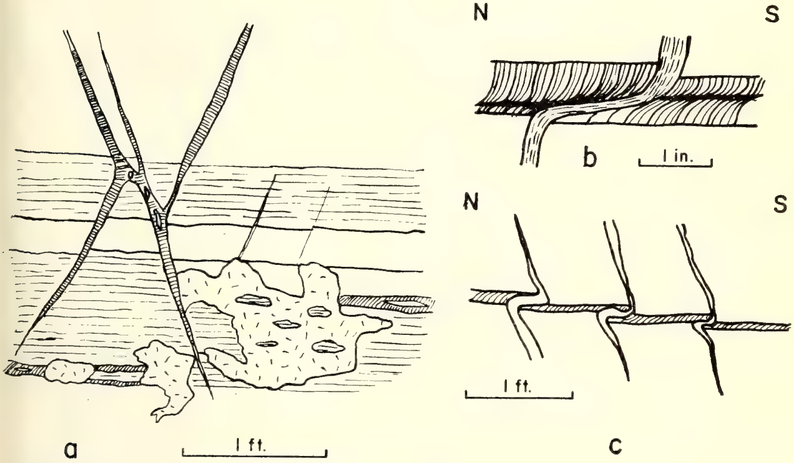

Fig. 1. *Relationships of the various forms of gypsum.*
(*a*) Nodular alabaster in the laminated beds, white veins parallel to the bedding and the cross cutting pink veins. (Unornamented bands are the more massive rocks); (*b*) and (*c*) Horizontal white veins cut by thin pink veins and both deformed by subsequent movements.

A study of the textural and age relations of the gypsum and the structure of the foreshore is in progress and suggests that the nodules are the oldest and were penecontemporaneous with the deposition of the sediments, whilst the white veins, parallel to the bedding, are folded and are earlier than the pink veins which cut them (Fig. 1b, c).

The normals to fifty-two of the pink gypsum veins and of bedding planes accessible at the base of the cliff are plotted on a lower hemisphere stereographic projection (Fig. 2). The plot shows that the axis of the fold and the line of intersection of the conjugate veins are essentially parallel and horizontal, with a trend of about 100°.

The gypsum veins all have sharp contacts with the enclosing rock, are individually variable in width and range up to 6 cm. across. The angles between the conjugate sets vary from 35° to 75°, the smaller angles being characteristic of the more massive beds and the larger angles of the laminated beds. Similar relationships have been noted by Bucher (1921) who stated that the angle of shearing is more acute in the more brittle beds of the sequence examined, and by De Sitter (1956) who noted a variation in angle between

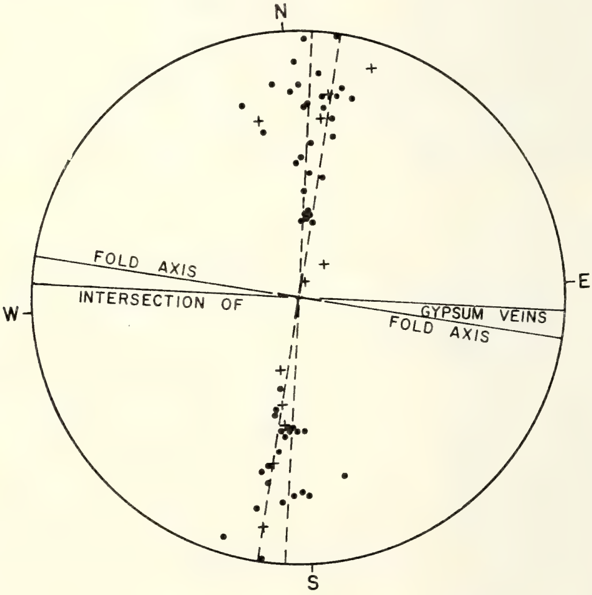

Fig. 2. *Stereographic plot of poles to conjugate veins (dots) and to bedding planes (crosses).* The pecked lines represent great circles through the biggest concentration of poles, and the fold and vein axes are at right angles to these.

15° and 90° depending on the physical properties of the rocks and perhaps on the overburden.

The dip of the conjugate sets varies across the anticline (Fig. 3a). On the north side one set is vertical and the other set dips about 35° to the south, whereas on the south side of the anticline the dips are symmetrical about the vertical with inclinations of about 75° N. and S.

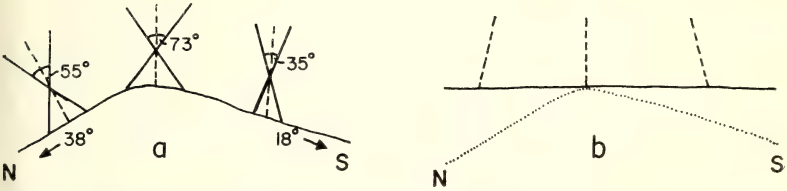

Fig. 3. *Relation of conjugate gypsum veins to the anticline.*
(*a*) As seen at present with the bisector of the acute angle (direction of maximum compression) shown by pecked lines; (*b*) Orientation of the bisectors if the beds are returned to the horizontal.

The unfolding of the asymmetrical fold and returning the beds to the horizontal (Fig. 3b) shows that the bisectors of the acute angles do not have a constant angular relationship to the bedding planes.

X-ray studies indicate that the fibrous satin spar is elongated parallel to the *z* crystallographic axis. The orientation of the fibres with respect to the margins of the veins ranges through normal, oblique, sinusoidal and chevronned (Fig. 4).

There is considerable evidence of movement within these beds.

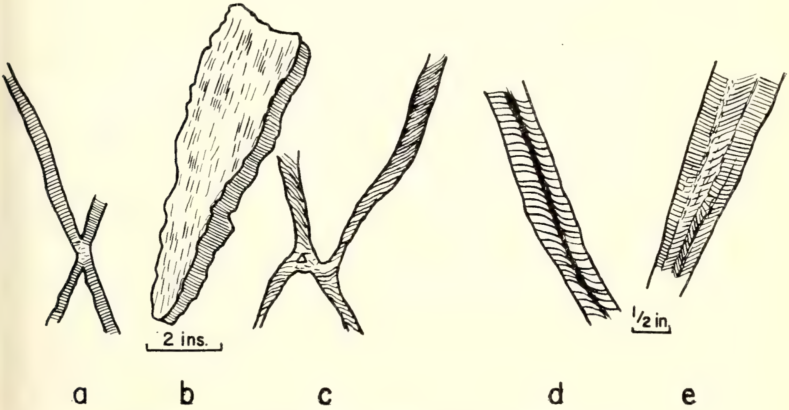

Fig. 4*a–e*. *Orientations of gypsum fibres in pink veins.*

The pink veins are often off-set at their intersections (Pl. VII, lower; Fig. 1a), the fibres show varying degrees of deformation (Fig. 4b-e) and the rock surfaces adjacent to the veins usually have down-dip slickensides. Further indication of movement is provided by small scale, normal strike faulting parallel to the conjugate gypsum veins (Fig. 5). It is clear that the acute wedges between the veins have moved towards the line of intersection as indicated by the arrows on the figure. This is characteristic of conjugate or complementary shears and Price (1966) states that there is abundant evidence to show that during the formation of such shear planes the direction of greatest compression intersects the acute angle formed by the planes. Hence at Blue Anchor at the time of formation of the conjugate veins the direction of greatest compression was approximately vertical whilst the least stress, possibly a tension, was horizontal in a N-S direction. This orientation appears to be anomalous in a fold which must have been produced initially by a stress distribution with the greatest compression normal to the fold axis, i.e. horizontal in the N-S direction in this case. From a similar distribution of shear planes associated with a gentle anticline in Kentucky, Bucher (1920) deduced that the active element in their formation was a horizontal tension developed at the crest of the anticline during folding and that the weight of the superincumbent strata, giving the compressive stress, was merely passive. Tension produced by arching on the outer arc of an anticline was adduced by Zwart (1951, discussed by De Sitter, 1956) to account for conjugate shear joints, later folded, in a gently folded dome at Robin Hood's Bay, Yorkshire.

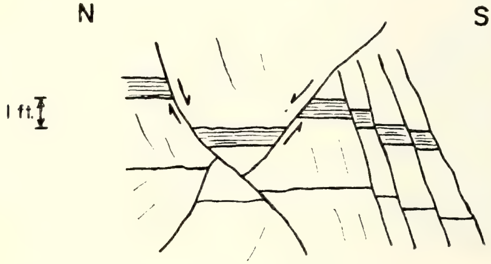

Fig. 5. *Normal strike faults near crest of anticline.*

In contrast to this, at Blue Anchor, the conjugate sets are well developed right across the anticline. Since the bisectors of the acute angles have differing angular relations to the bedding (Fig. 3b) it is unlikely that the joints were formed before the folding. Therefore the sequence would appear to be a N-S horizontal compression to produce the folding, giving rise to a local N-S tension which formed the shear joints.

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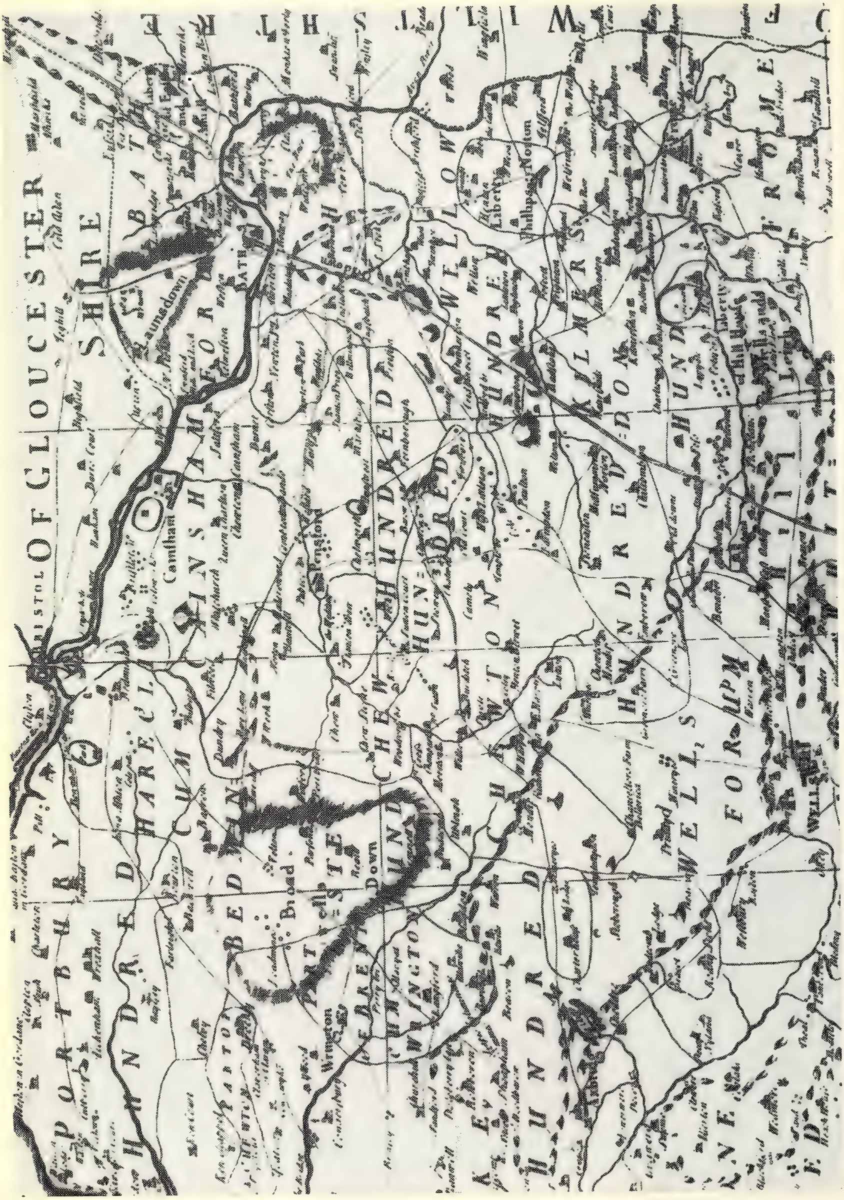
OF GLOUCESTER SHIRE
BRISTOL
Lansdown
WELLS

North-eastern part of Strachey's map *Somersetshire survey'd and protracted*, 1736, showing many of the localities mentioned in the manuscript. Reduced almost 3 times from the original.

OF STONES, FROM THE MANUSCRIPT OF JOHN STRACHEY'S PROPOSED *SOMERSETSHIRE ILLUSTRATED*

By B. D. Webby

NEARLY two hundred and fifty years ago John Strachey published three small papers on the strata in coalfields of Great Britain. The first two, *A curious Description of the Strata observ'd in the Coal-Mines of Mendip in Somersetshire* (1719) and *An Account of the Strata in Coal-Mines, &c.* (1725) appeared in the *Philosophical Transactions* of the Royal Society, the third, as a pamphlet entitled *Observations on the Different Strata of Earths, and Minerals. More particularly as are found in the Coal-Mines of Great Britain* (1727). This last work incorporated the results of the earlier papers, and included many additional observations. The papers contained the first illustrated cross-sections of a fault and an angular unconformity, the sections being accurately located, orientated and of a known length. Eyles (1955, p. 131) has observed that these publications "show him to have been one of the earliest English geologists who was an observer and recorder of geological facts, rather than a theorist. He made what were, for the time, outstanding contributions to stratigraphical geology. . . ."

John Strachey, F.R.S., the son of John and Jane Strachey, was born at Sutton Court in the parish of Chew Magna in 1671. Little is known of his youth. At the age of three he inherited the estate and, at sixteen, as Edward Clarke wrote to John Locke, the philosopher and family friend, he had "grown tall and very like his father in person and humour" (Rand, 1927, p. 228). He was attending Trinity College in Oxford, but did not remain there long. On his twenty-first birthday he married Elizabeth, daughter of William Elletson of Alverstoke, Hampshire, who bore him eighteen children. He was elected a Fellow of the Royal Society in 1719. From his widespread travels through Great Britain in pursuit of his antiquarian interests, he became very familiar with the scattered repositories of historical records. He has been referred to as "a student of a very painstaking, as well a very dry, character" by Sir

Edward Strachey (1899, p. 7). His wife Elizabeth died in Edinburgh in 1722 and, two years later, he married Christina, daughter of Richard Stavely of London, who bore him a son. In later years he continued to follow his antiquarian interests instead of attending to the business of running the estate and it consequently became increasingly burdened with debt. Most of these later years were spent in Edinburgh and travelling about Great Britain. He died at Greenwich in 1743.

In addition to his geological writings, Strachey published *An Alphabetical List of the Religious Houses in Somersetshire* (1731), a *Map of Somersetshire* (1736) and *An Index to the Records, with Directions to the Several Places Where They Are to Be Found* (1739). He left several unpublished manuscripts including corrective notes for Dugdale's *Monasticon* (Bodleian Library, Oxford), letters addressed to John Pointer on the Roman camps in Somersetshire (British Museum), and part of *Somersetshire Illustrated; in A Typographical Description and a Natural and Geographical History of that County* (Somerset Record Office, Taunton). The printed *Proposals* of this latter work is dated July 24, 1736 (Sir Edward Strachey, 1869, p. 94), but he never managed to see it into print, probably owing to his declining years and lack of funds.

A 37-page fullscap manuscript, DD/SH 116, housed in the Somerset Record Office, proves to be part of the natural history section for the proposed *Somersetshire Illustrated.* It is a fair copy probably made by a scribe, and deals with the topics coal, stones, metals, plants, animals, fish and "Humane Creatures." In the *Proposals* Strachey observed that the natural history section followed "mostly the Method . . . of Dr. Plott." The first part of the manuscript consists of a slightly revised version of the *Observations on the Different Strata of Earths, and Minerals* (1727). The most important difference is the addition of descriptions of the coal mines in Flintshire. The second part of the manuscript, from pages 16 to 27, is the section on stones and metals, and forms the basis of the present paper.

Strachey did not merely follow Robert Plot's method of presentation; he also adopted some of his ideas. Certain passages in the manuscript dealing with the formation of stones and fossils are taken directly from Plot's *Natural History of Oxfordshire* (1677) and *Natural History of Staffordshire* (1686). Plot viewed stones as chiefly formed by petrifaction out of salts with a mixture of earth and sometimes sulphur, and fossils as *Lapides sui generis*, produced by a "plastic virtue" in the earth or quarries acting on certain salts.

The manuscript records numerous observations of different stones in Somerset and elsewhere, and a most important passage on the differences between coal seams and veins of lead. Unfortunately Strachey confused the topographical and stratigraphical relationships between coal (Coal Measures) and lead (in the Lower Palaeozoic and Carboniferous Limestone hills), viz., "this Coal Country . . . is likewise traversed and intercepted by such Lead Hills in several Places, and these always lying higher than the Coal." (*Observations*, 1727, p. 6). Yet, in this manuscript, he made what is a most significant and undoubtedly a correct observation on the difference in appearance of coal seams and lead veins. A seam of coal may be followed "on a Levell a long way," he observed, "but . . . you are soon thro' its perpendicular thickness." On the other hand, "Lead branches itself among the Rocks so that it cannot be followed on a drift or level as Coal nor do you ever know the perpendicular depth." It is "often pinched Up between the Rocks to the thickness of half a Crown and then perhaps opens Again 12 or 18 Inches more or less."

The manuscript can be dated after 1731 since it incorporates material published in the *Observations* of 1727 and refers to Mr. Allen's wagon-way at Prior Park, which was built about 1731. It is a fair copy and was probably ready for publication at the time of the appearance of the *Proposals* in 1736.

Every effort has been made in editing the manuscript to retain the original style and content of Strachey's work, and corrections and other modifications have been kept to the bare minimum. However, it has been necessary to punctuate a little, at least to render the text easily readable, and to correct some of the more obvious mistakes in spelling. For example, *Vertiol*, *foreing* and *Pibles* have been silently corrected to *Vitriol*, *foreign* and *Pebbles*, respectively. Capitals have been added regularly at the beginning of sentences. A few words have been added to the text and are enclosed in square brackets, and a few words have been omitted where they are obviously redundant.

The north-eastern part of Strachey's map of Somersetshire is reproduced (Plate VIII), showing many of the localities mentioned in the manuscript and including the occurrences of "Cole works," "Mineryes," and lead and Lapis Calaminaris mines. In some cases a locality on the map is spelt differently in the manuscript.

It remains to thank Lord Strachie of Sutton Court for permission to consult the Strachey papers at the Somerset Record Office, Taunton; Mr. I. P. Collis and Mr. D. M. M. Shorrocks of this office for help in securing a photocopy of the map, checking the typescript against the original manuscript and offering numerous useful suggestions; and my wife for reading the text and advising on editorial matters.

OF STONES

1st. of Such as serve to Supply the Necessitys of Mankind.
2. of Such as are for Ornament and Delight whether Transparent or Opake.
3. of formed Stones.
4. of Mettallick Stones and Mettals which are Extracted from Stones.

It is a very probiable Opinion that Stones are Coagulations of Salts and Earths or Made by the Meetings of Solutions of Acid & Alchalixite Salts which Compound Transparent Opake and Semiopake Stones according as they are more or less mixt with Sulphurs and Earth of different finesses & purifications. For wee know of nothing in Nature that Unite as those 2 doe. As the offa made out of the Spirits of Wine and Urine rectyfied and another of Vitriol and Salt by a Solution of Saturn &c.[1] And if Anyone doubt whither Stones and petrifications arise from Salts let him but ask the Chymists whither they find not all indurated bodys such as Stones, Bones, Shels, &c., most highly Sated with a Saline principle & some Mixture of Earth and Sulphur which give as I said the Opacity of Transparency.[2] Those which with frost or Rain Slake like lime, are freest from Sulphur and Consequently will Improve lands, as Chalk, &c.

Thus Transparent stones seem to be made of pure Solutions of such like Salts and Transparent Sulphurs, purified by filtrations thro' the pores of the Earth. Thus a Tartarious Salt meeting with a pure Solution of Sal Geminae and a white Sulphur or Bitumen may possibly make a Diamond. The same Alcalious Salt with Native Cinnaber may Make a Ruby; with blew Vitriol a Saphir, with green Vitriol an Emerald, with Orpiment a Topaz, and so in like Manner with others.[3]

But because all Stones may in some sence be termed Petrifications[4] let me speake something more of petryfied waters for in the Chapter of waters I treated of such only as were incrustations and barely superficiall. Now a Word of such where the Very bodys of the waters are turned into stone as it drops from the Rocks; a most Notable Instance whereof we have in the Cavern at Wookey[5] in this County where the passages in some places were they not purposely broke down would soon be obstructed by these Lapides Stillatitii[6] which continually, as the Drops fall from the Roof Conglutinate and become a firm stone. Here may also be observed the Degrees of Operation: The botton or Oldest part being a hard and Solid opake stone and so lessens both in Opacity and hardness, till the top which is Newly fallen is little more then the Consistency of a jelly and as the Water Transparent. In the same manner several stones hang like Iceakles from the Roof, the Connicall or lower part newly formed being Soft and Transparent, the Upper part which is older is Opake, and as hard as the Rock itself.[7] It will likewise in a fortnights time Encrustate a Tobacco pipe or any substance thrown into it, but whither it in time will Change the substance I have not maid the Experiment.

Next for such petrifactions as are made by water per minimi[8] and the body of wood or any thing else wholy transformed into stone. The reason of their Difference from Incrustations may probably be that some of these petrifying particles contained in the water may be more then others by reason of which Sublelty and fineness. They are carried with the waters into the Closest Texture whereas the others by reason of their Grossness Adhere only to the Superficies as we have said in the treating of Waters.

Limestone. There is great quantity in almost all parts of this County the Marsh excepted. The most in repute is Cheddar and Gurnyslade by Binegar, at Elm and Vales,[9] of all which they send for the best work to very remote parts. They burn it altogether in round kilns built about 12 feet in hight, & Closing Connicall in their bottom, where they draw forth the lime at an Eye or two. They burn it with pit Coal, laying that with the stone stratum super Stratum to the top. They make lime also of blew & white lyas, of Marble & in some places of freestone.

Flynts. Of Flynts the County affords few or none, tho' many stones will strike fire and for that reason are Called Pyrites by the Naturallists.

Of Stone Used by the Masons for building and walling there is an Excellent Blew lias Dug in the Cornfeilds near Somerton and all there abouts which if the Outside be hewn off is within Very hard, and receives a good polish and casts a blewish Colour, of which Stone the Magnificent but abortive building of the late Lord Stowell is Erected, all the front polished. The Banwell and Shepton[10] Lias one being dark blew the other white mixt in squares for a flore at Mr. Jones at langford has deceived even Curious Eyes who have taken it for Blue and white Marble. The lias both white and blew is plenty in most parts of the Country; both sorts is also often burnt for lime. Of the blew lias there are very good Quaries all along on the hills between Clutton, Henton, &c: which they there Call Cornish stone,[11] which is Very good being much of the same thickness for all sorts of sizable work, and Under it lyes a thick stone but *not so good for walling because it Drinks Water*. However both Make a good lime and is for that purpose much Used.

The White lias is in perfection about Timsborow so that of it are made flour pots &c: and for all Uses of the stone Cutter, very white and beautifull. For paving and tyling there is no Stone comes near that of Brisleton which the Quarry Men call *pennant*[12] so smooth natuarly that it Needs little or no hewing, easy to be wrought and with all very durable and tho' very Smooth not Slipery, and Much of it is transported as far as the Western Islands for tombstones, it rising so large that it is Usuall to have a Stone 8 or 9 feet long and 3 sometimes 4 feet over. Another property it has that *it Never sweets, a great Commendation to Neat Huswives*. Of which also they *Make Styles* which for safety of Cattels legs in case they leap as well as for Durableness is much Commended. Of the same sort of stone are most of the tiled Houses thereabouts Covered. Like this but more of an Iron stone is dugg which is also a large and thin tho something more Stubborn to Work about Clutton and Curles[13] not far from Chew[14] and some other places. The only fault for tyling is that the Weight requires strong timbers then Modern builders Usually allow. It is a Pyrites and will strike fire. But for tyle stone the best, lightest and most durable is Dugg about Phillips Norton and so towards frome. Tis a whitish grey, and the longer in the Air [the better] it grows. It seems to be the top or leading of freestone.

There is also a *place near Clutton Mendip*[15] a good stone for pavements very white and Harder then freestone.

Much such another stone is dug at Chiply[16] in the grounds of Edward Clark Esq., and this lyes in a bed of Red Earth out of which it is Doubtless generated and hardned and whitened by some Subterraneal heat or Cold, for it is Evident that in whitening as well as hardning that both or either of those qualitys will perform the Operation. Thus we see the Calx of all stones is white, the Cinders of Coal and Ashes and all things that have been burnt are whitened (so the Cold also turns the hares and foxes in some Countrys white), but to Clear all in one of these blocks of Stone when working for a pillar to be set at the front of the house, with in the Solid Stone was found a Clott of the same Earth or Clay not at all petrified and the Circumambient stone plainly Enough Discovered to any ones sight all the Degrees of Operation both as to hardning and whitening.

In some of the Estate belonging to the Same Gentleman is also Dugg a very good sort of black Marble of which he has several hearth paces and Chimney peaces in his Neat New built house there.

For Heaths, Ovens and backs of Chimneys there is a peculiar sort dug in the Woodlands so soft as its first Coming to land that they work into backs with Mouldings but afterwards with fire grows still harder and is durable to the end of time.

There is good freestone Dugg at severall places as at *Dundry*, Oddown and round about bath, and at Dultin[17] which is to much Inland and Hamon Hill,[18] but that at Dundry is found to Decay with out Doores wherefore that about bath which is both whiter and harder is in better Esteem for Pillars, gates, Statues &c: which are Exposed to the wheather,[19] the river being now made Navigable [to] Bristoll and other places, being better supplyed hence then from Dundry. The *great work carried on at Comb*[20] by Mr. Allen and the waggan way in the Manner of those at Newcastle are the worthe Notice of the Curious of which sea the Description in Comb and Widcomb.

But of all stones for beauty I know none equally that Dug at Dracat[21] not far from Cheddar and at Bobster[22] in hardness equalling and in beauty surpassing the foreign Marble. When Dug it is very rugged, Uneven and ill Coloured like a Comon stone full of branches, knobs, Cockles and Pebbles but when polished is so gobbonated with all variety of beautifull Colours that at a Small Distance any Stranger would take it for a Curious peice of Inlaid work, but the Country it lies in being so ill for portage and the Difficulty of Charge of polishing it and the few Gentry in that part of the Country is the reason I Suppose why no more Used. It riseth in great breadth fitt for Any Use Commonly 8 or 7 feet long and a Yard over. In the Church of Wedmore are two tombstones of it, that of the Hodges tho' now scratch and battered it shews its Goodness. In the Mansion House by is also a very large Mantle peice of it well polished and in some other places, and I think Deserves to be Aplied to all Uses for which we go so far to fetch foreign Marble not Equal to this so Ornomentall, tho homebred porphery. At Bobster also they Dig the Same Sort of Stone of which there is a Very large table at My lord Weymouth at Longleet[23] but the fault found in this sort of Stone is that it will not take so high a polish as some other Marbles.

Neither are we altogather destitute of precious Stones. In the Rock Opposite to Saint Vincents in long Aston some few Rubies have been found, Diamonds Equal in lusture [to] the Oriental. Only in hardness they fall short and its Remarkable that on this Side [of] the River[24] they are found Hexagonal in Clusters in flynts of a round fine Reddish Colour and hollow within. On the other Side Mostly Single but Angularaly. These all go Under the Name of Bristol Stones and were it Not for the Commoness would have greater Esteem.[25] Agats and Chrystalls are Many times found among the Rocks of Sparr in Mendip Hills and indeed seem to be Only Sparr improved.

Of Formed Stones—Of the Bronticae Ombricae[26] or Bellamites[27]

Transparent Mr. Beaumont relates to have found Severall in the Roads of this Country, these he Immageines to be formed of a Coagulations of Dews falling on Nitrous Streams.[28] They are Said to be good for Ocular Distempers in horses.[29]

Summitates or Stone fig: Penis absq Preputio[30] are said to have been found by Beaumont in Mendip Hills.

Trochites[31] or Stones resembling wheels and Entroychites[32] or wheels within wheeles have been found by the same Author.

In a lane between Chewton and Mendip I saw a large Stone in it, the fig: of an Astorite or Starr. Tis Said some of these Asterites will move in Vinaga /Plott /.[33]

In an Old wall at Wilmerton[34] I saw placed a Stone which may be either Ranked with the Stellites or Ophomorphiles or Trochyles or Astroites.[35]

But above all the formed Stones of Ophomorphiles or Cornua Ammonis[36] Stones Resembling Snayles or rather Snakes do chiefly abound and that Not Only about Keynsha where Camden takes Notice of that, but about Corston, Newton St. loe, Twiverton[37] to Bath in such plenty that Scarce a Stone in the high way but is of that Sort either more or less visiable from an Inch to a Yard, sometimes a father Diameter. How stones of that bigness and in such plenty shoold be formed in Nautilar Shells as the Naturalists (who rather talk Noncence then say nothing) would make Us beleive is yet a Mystery. They are always found without a head, the tayle turned Inward and in Basso releivo or Inbossed work.[38] Plotts Opinion is that they are formed by two Salts shoothing Different ways like as a whirlepole making a Verticall figure, or by Some peculiar yet Unknown Salt that has this property,[39] but in all the digging there is No such Salt found. The Earth next Under these Stones which [are] of the lias kind and Makes good lime, is a fryable Yellowish Malm or loom and that succeeded by red.

Now as to the formation of all Stones the Naturalists say the principal Ingredients are Salts, and if so, much more [in] formed stones, it being a perogative of the Saline principal to give bodys their figures as well as Solidity and duration, no other principall shoothing naturally into figures each of its one kind but salts. So Nitre shoots into pyramids, Sea salt into Cakes, Allom into Octa ones, Sall Armoniack into Hexa drams and other mixt Salts into mixt figures. Of these Inclination of Salts there is a further Evidence in the Anatomy of Animals particularly the Volatile Salts of Hartshorn which in the head of the Cucurbitt Naturally branches into figures of the horn, and so the Salt of Vipers shoots into Snakes like that Animall.[40] What sort of Solts each sort of Stone is formed of is hard to Determine. Dr. Plott thinketh the Ophomorphiles are formed by 2 salts shooting Different ways, which like a whirlpole meet and make a Helicall figum.

Lime Stone, Lyas white and blew [is found at] Pimbery,[41] Shepton, Bannet;[42] freestone as at Bath, Dundry, Hail Hill.[43] Redstone in all the Red Soyl, freestone at Nunny; Marble at Dracal,[44] Bobster. Called Pennant tyling and paving as Brisleton, Curley,[45] Naylsy, Clutton. Flynts none in these parts; Merchasites in the Coal and Marle pits. Grindstone, Whetstones, Mill Stones, tuck stones, Hones I know none. Sand for Glass is Made out of the red Stone . . . [46]

Its Observiable that where lead Mines are, there are Caverns Near them, and in these Caverns, the Sparrs hang like Iceakles, from the roof, whence the Water Drops. At Wokey hole there are several such which Dropping from a Sugar loaf at the bottom and meet the others in time which Congeal from the Top. In these the progress of the Petrafaction is Very visible, the Extremities either ways being Very Soft and Almost or Sometimes quite liquid and those what have been longest still harder Congealed. In Cheder Cleves, Under Dolebery Camp,[47] which some will have to be Artificiall, tis odd that in the Sand of this last hole which lyes at the bottom there are prints of the feet of foxes and dear tho' there have been none of the last, for this last Century. In lamb hill above Harptree is a Cavern[48] where you descend 10 fathom; some will also have it to have been a lead Mine now Exhausted. The Hill About it did formerly abound in Oar.

In Elm is a Cavern Called poking hole, not a passage as some have Imagined to the Opposite fortification of Tedbury[49] for that would have been an immense labour to have Undermined the River, which is at least 30 fathom [deeper?] than the Rocks on either Side but Made [by] hands either for lime stone of which it is Composed or on search after lead or Coal, the last being found but a Mile from it.

Lapis Calaminaris is Medicinally Used for Clearing the Sight but in Greatest quantitys for Making of brass. [It] was first Discovered in Mendip hills in the beginning of Qu: Elisabeth Reigne at the sametime that Cooper was Rediscovered in Cumberland.[50] It's Dug chiefly about *Shipham* and mostly in pits. That Stone is very hard including a Natural Brimstone. It's Yellow or sometimes orange Colour with Sparr between the Cavities. They first Buddle or wash the Oar, as Lead or Tinn, than Calcine it by making a large round Arear like a Charcoal heath, of faggots outward and Charcoal within a Yard from the ground. Then a Stratum of the largest Stone of the Calaminaris, and then Smaller till all is laid and then fire it, thus takes the Sulpur from it. After this they Beat it to pieces. This was the Method as Dr Brown tells you was Used in Germany.[51] Here they prefer a Kiln to an Open Hearth[52]—The same Author for Making brass says they take Calcined Calams 100£, Copper 28£ and the Dross of both but first put into large Crucibles some pieces of brass and the Dross and then the Copper and let Stand 12 houres, after which they put Eight Crucibles full into one and let what will run over, the best always Sinking to the bottom, and then Casting it into a Stone frame bordered with Iron run it into plates[53]—This Mixture of Lapis Calaminaris makes brass Not only the harder but Cheaper Mettall then Copper.

Dr. Brown tells us Lapis Calaminaris is found within 2 Leagues of Aix but in the Territories of limburg and wrought this 300 years (lothorps volum 2, p. 554 & 555).[54]

OF METTALLS

Of these we Enjoy an Equal quantity with most, and more than any other Countyes, for Silver in Considerable quantitys is found to be conteyned in the lead. But it not Answering the loss of the lead is not generally worth the Extracting, But for lead the profit is more Considerable. Mendip Hills *have here to fore been much more famous than they are at present;* Broadwell Down afford good plenty.

The Veins are Many times discovered by an Oyly smell especially in a foggy Morning.[55]

The Oar is often found in a Pyramidal form and the rust which lyes over the veines of lead shoots Pyramidally like the Sparr and oftentimes Pentagonall or Hexagonall.

The Grovers have their peculiar terms of Art which in Most places are nearly the same, & by Mr. fuller in Derbyshire are given, as in the following Rhimes . . . [56] The lead of Mendip and of this County is not Accompted altogather so soft and Plyant as that of Darbyshire and therefore not so good for sheeting, but fittest for Bullet and Shott tho' for the former it serves also Indifferent well.[57]

The Bishops of Wells have had great benefitt of it, Especially Bishop Still who is said to have the harvest, Bp. Montague the Gleaning and Bp. Lake the Stubble.[58] Its free for Any English Man to work on these Hills Subject however to Certain laws among themselves which were anciently Settled by Chief Just. Chock,[59] among which that which they Call *burning the Hill* is Very Remarkable. The person found guilty of Stealing any oar or Working tools is shutt up in one of their Hutts made of Turf, in which they put the Oar. This is Encompasse with fern furz, &c: and when it is on fire, The Criminal who has his hands and feet at liberty is allowed if he can to work himself a passage through the hut to make his Escape but must Never after work there or have anything to do about the Hill.[60]

As Coal Spreads like a blankett in a Continual Spirall Coat, Lead branches itself among the Rocks so that it cannot be followed on a drift or level as Coal nor do you ever know the perpendicular depth, whereas you soon cut thro' the Coal some Seams being only 10 Inches others as Many feet—Lead is often pinched Up between the Rocks to the thickness of half a Crown and then perhaps opens Again 12 or 18 Inches more or less. The Strata above it are 1st Ruble Stone then Slate or Slag, a Shattering blewish Stone hard in digging but Crumbles and Shatters in the Air, this is sometimes 20 Yards Deep. Lead is Never found in this Slagg but if you find a lime Stone Under it it's reckoned a very good Sign that Lead is at hand.[61] Many Miners in flyntshire affirm that the general Dip of Lead there is to the 12 o'Clock, and the Coal to the Eleven o'Clock Sun[62]—Lead Oar is mixt in Sparr and the Sparr is Inclosed in Rocks of lime Stone but seldom a Solid Rock over.[63] The Earth between these Rocks is allways of a Yellowish Colour. Sparr is also the bed or Seat of Christalls and Bristol Diamonds are found in such Veins of Sparr Inclosed in limestones Rocks. Se wee are told the Diamond Mines of Quotara in East India are in a yellowish Earth full of Small pibbles like our gravel pits. Those of Malabar lye in More Reddish or rather Orange Colour Earth about 4 fathom Deep,[64] to which the Surface of the Earth on St. Vincents Rock by Bristol is Orange Colour but gradually Changes to yellow.

Lead differs from Coal in this: When you meat with a Seam of Coal you may follow it on a Levell a long way but as above you are soon thro' its perpendicular thickness but on the Contrary a Branch or Vein of Lead is not long on a levell. Tis wrought either from the rise to the dip or E Contra & as deep as Water or Other Obstacles will permitt.[65]

At Minera[66] in Denbighshire are Vast Old Works said to have been wrought by the Antient Romans who with Vast labour threw open their levels and Addits to the Day. The Chiefest Oar both for Quantity and goodness yet there is by Ridding Up the Old Man as they Call it, that is Clearing up those old levells and working Under them. On the other Side also from flynt South after you have Crossed the River Allayn[67] the Red Soyl changeth to Orange Colour and to a more Yellow Earth where on Mould Mountain[68] are several works particularly Mr. Robinson at Cavan Baugham which runs E & W. The Veins at Cavan Vaughan Dip west yet . . . Pot hole[69] is in Denbyshire.

There were formerly four lords of Mendip in the Mortimer Rose (so Called from his being Baliff of the Forrest in the time of Edward the third).

First the lord of Bath, 2^d. the Abbot of Glaston, 3^d. Lord Bonvile, 4^d. lord of Richmond who Signed these laws Mentioned before. So Leland[70] says there were 4 lords, 1^t. the King whose Right was granted in fee Farm to the Bishop of Bath, 2^d the Abbot of Glaston, 3^d Bonvile and *now the Marques of Dorset*, 4^th Gourney and now Caradoc alias Newton, which had all their Mineries, the 1^t Near Pridye,[71] the 2^d Near Charter House wherefore some have Affirmed that the Abbot of Charter House not Glaston was the 2^d lord and indeed since the Reformation the Lord of Charter House and *lately Mr. Gore* have been one of the Lords Royall,[72] the 3^d is *Chewton Mineries* and the 4^th *Harptree Mineries*.[73]

Copper and Lead are very Regular and run almost perpendicular and are seldom lost when the Main Vein is found but grows richer and wider as they grow Deeper.

Copper Mines are first met with about Comb Sydenham[74] in Somersetshire and in several places in Devon and Cornwall Mixed with the Tinn—

In Cumberland at Alston More, is a Copper More.

At Keswick in Cumberland is both Copper and Lead Mixt and so in Scotland.

At Disert and Talergoth[75] have been found Copper Oar but in no gerat Quantity.

At Keswick S^r. John Pettis imployed 400 Men in one Copper Mine.

At S^r. Carbery Prices Mines at Eskirhir[76] in Cardiganshire a Vein of Green Copper Oar 4 feet wide yields 3 Turn of Copper from 20 tun of Oar and lyes between Veins of Lead. The Drift or level of it is East and west. There is a Cross Vein of Brown Copper Oars 5 feet wide yielding 5 turn out of 20 or ¼ part. The first is found at 3 Yards, the last at 15 Yards Deep.

NOTES

[1] This passage is taken, in condensed form, from Plot's *Natural History of Staffordshire*, 1686, p. 150. The original version is as follows: "It has been an opinion that challenges no great seniority, that *Stones* are coagulations of *Salts* and *earths*, which if finely mixt, sublim'd and percolated by the means of *heat*, and after condensed by *cold*, make a *transparent stone;* and if but grosly mixt with little or no percolation, an *opake* one; wherein though I cannot deny but there may be somewhat of truth, yet I think it will be more particular, and more home to the business, if we further add, that this *coagulum* or petrification is rather made upon the meeting of the solutions of *acid* and *Alcalizat* salts; and that these doe compound transparent, semiopake, and opake stones, according as they are more or less mixt with *sulphurs*, and *earths*, of different finenesses and purifications.

And this I take to be very probable, because we know of no things in nature that unite so strictly as these two doe, makeing a *coagulum* in bodies that at first sight seem very unlikely to performe any such matter; witness the *offa alba* of *Helmont*, a thick gross substance, far from the nature of a *liquid*, made out of the spirits of *wine* and *urin* highly *rectify'd;* and another such like *Offa* made of the spirits of *Vitriol* and *Salt*, by a solution of *Saturne* made with distill'd Vinegar . . ."

[2] This sentence is taken directly from Plot's *Natural History of Oxfordshire* (1677, pp. 32–3), 2nd Edn., 1705, p. 33: "If any body doubt whether Stones, and so *Petrifactions*, arise from *Salts*, let him but consult the *Chymists*, and ask, whether they find not all *indurated* Bodies, such as Stones, Bones, Shells, and the like, most highly sated with the *saline* Principle? Some Mixture of *Earth* and *Sulphur* 'tis true there is in them, which give the *Opacity* that most Stones have; from which, according as they are more or less free, they have *proportionable Transparency* . . ."

[3] The paragraph comes entirely from Plot's *Natural History of Staffordshire*, 1686, pp. 150–1: "Thus *transparent stones* having little or nothing of those terrestrieties the *opake* ones have; seem to be made of pure solutions of such like *salts*, and transparent *Sulphurs*, or *Ambers*, all purifyed by filtrations through the closest colanders, and then fixt upon meeting. Thus a *calcarious* or *Tartarious Salt* meeting with a pure solution of *Sal gemmae*, and *white-ambrine Sulphur* or *bitumen*, 'tis like produces an *Adamant* or *Diamond*. The same *alcali's* meeting with a pure solution of *native Cinnaber* make a *Ruby*, with a solution of *blew vitriol* (for there is a natural blew Vitriol as well as an artificial) a *Saphir*, with solution of *green vitriol* a *Smaragd* or *Emrauld*, with solution of *Orpiment* a *Topaz*, and so for stones of all other intermediate colours, or mixt of these in proportion as they partake more or less of one or the other."

[4] They are classified by Plot as (i) those formed from a body of water turning to stone (e.g., stalactites), (ii) incrustations of a superficial nature, and (iii) petrifactions *per minima* (or *totum per totum*), which result from a fine steam pervading the entire structure of the body. *Natural History of Oxfordshire* (1677, pp. 33, 35), 2nd Edn., 1705, pp. 34, 36.

[5] "Ochie-hole" is mentioned in Camden's *Britannia* (English edn., 1637, p. 230), and described by Beaumont in the *Philosophical Collections* of the Royal Society, 1681, pp. 2–3.

[6] Stalactites.

[7] Gibson observed in additions to a later edition of Camden's *Britannia*, 1722, p. 83, that in Wookey hole "the droppings of water encrease the rock, and are turn'd into stone; in some places hanging like icicles." The view accords with Plot's general statement of the "very Body of Water being formed into Stone as it drops from the Rocks" (*Natural History of Oxfordshire*, 1705, p. 34), but differs from the interpretation of Woodward, that water collects "Sparry Particles" in the strata and, in dropping into the cave, leaves the particles to incrust and form stalactites. *Essay toward a Natural History of the Earth* (1695), 3rd Edn., 1723, pp. 211–2. Dale expressed a similar Woodwardian view (*Phil. Trans.*, 1704, p. 1572).

[8] Plot's 3rd class of petrification. See note 4.

[9] Vallis, near Frome.

[10] Shepton Mallet.

[11] Arkell and Tompkeieff note that "Cornish" is a common corruption of "cornice," a name applied to a projecting ledge left during mining or to a particular mined seam. (*English Rock Terms*, 1953, p. 30). Differs from "Cornish-Stones" mentioned by Woodward which are quartz crystals (*Essay toward a Natural History of the Earth*, 1723, p. 198). See also note 25.

[12] First mentioned by Strachey in *Phil. Trans.*, 1719, p. 972.

[13] Curl's, 1½ miles south-east of Chew Magna. At both Clutton and Curl's, sandstones of the Pennant Series crop out (see 1″ Geol. Survey Map, Bristol District, 1962).

[14] Chew Magna.

[15] Clutton has been used in place of Chuton (=Chewton).

[16] Between Milverton and Wellington.

[17] Doulting, east of Shepton Mallet.

[18] Hamdon Hill, 5 miles west of Yeovil.

[19] "to the wheather" was originally misplaced at the end of this sentence.

[20] About 1731 Ralph Allen Esq., built a wagon-way with a 3-ft. 9-in. gauge to transport Bath stone from his quarries on Combe Down to the River Avon. The loaded wagons descended by their own gravity some 450 ft. in a distance of about 1½ miles (Lee, 1943). As Strachey rightly observed, the wagon-way was similar to ones at Newcastle, where they were used mainly for transporting coal from the pits. Allen was also responsible for the building of Prior Park, just below the summit of Combe Down, during this period. Collinson observes that it was started 50 years ago and finished in 1743 (*The History and Antiquities of the County of Somerset*, 1791, 1, p. 170).

[21] Draycott, south-east of Cheddar.

[22] Vobster, between Coleford and Mells.

[23] Longleat House, 5 miles south-east of Frome (in Wilts.)

[24] Presumably on the south-west or Somerset side.

[25] Rock crystal, formerly known as Bristol Stones or Bristol Diamonds. Camden observed that the high rocks on the east side of the Avon are "call'd S. *Vincent's*, and is so stock'd with *Diamonds*, that one may gather whole bushels of them . . . The other rock on the western bank is likewise full of *Diamonds*, which by a wonderful contrivance of nature are contain'd in hollow reddish flints (for the ground here is red) . . ." (*Britannia*, 1722, p. 96). Owen (1754) gives a long account of the crystals. Merret (1678) noted that they are the same as Cornish Diamonds and "seem . . . to be but a finer, purer, and harder sort of *Sparr*."

[26] Echinoids.

[27] Belemnites.

[28] Beaumont gives a description of the objects but does not name them; see *Phil. Trans.*, 1676, p. 735.

[29] Taken from Plot's *Oxfordshire*, 1705, p. 96.

[30] Called *lapides figura penis absque praeputio* by Lachmund (in Plot's *Staffordshire*, 1686, p. 192).

[31] Single, disarticulated crinoid columnals.

[32] Articulated crinoid stem columnals, also referred to as St. Cuthbert's Beads (Lister, 1674, Lhwyd, *Phil. Trans.*, 1712, p. 467).

[33] Plot observes that the stars "if but steeped a Night in *Vinegar*, or other sharp Liquor, may be divided the next Morning with Safety and Ease" (*Oxfordshire*, 1677, p. 86; 2nd Edn., 1705, p. 87). Beaumont mentions that "The Stones . . . generally move in Vinegar, the juyce of Lemmons, &c." (*Phil. Trans.*, 1676, p. 731).

[34] Probably Wilmington, south-west of Bath, or Kilmersdon, south of Radstock.

[35] It is not clear what type of fossil Strachey observed here. "Stellites" may be some star-shaped structure, "Ophomorphiles" is an ammonite, "Trochytes," a crinoid columnal, and "Astroites," a compound coral with a radiating structure.

[36] Ammonites.

[37] Twerton.

[38] First mentioned by Leland between 1535 and 1543 as "Stones figurid like Serpentes wound into Circles found in the Quarreis of Stone about Cainsham" (Leland's *Itinerary*, 1745, **7**, p. 97). Camden, whose *Britannia* (1st edn.) appeared in Latin in 1586, enlarged on this observation: "I have seen a stone brought from

thence, like a serpent, in a round, the head whereof, tho' but imperfect, jetted out in the circumference, and the end of the tail was in the center; but most of them want the head." But Gibson adds in the edition of 1722 (p. 93) that "all our Naturalists now agree, that such stones are form'd in *Nautili* shells, and that there are no heads belonging to them." Strachey disagreed with the nautiloid interpretation, although he granted that they had no heads. The Keynsham occurrence is also mentioned by Hooke, in his *Micrographia*, 1665, p. 109, and by Owen in a chapter on "Snake Stones," in his *Observations . . . about Bristol*, 1754. Ray, in his *Miscellaneous discourses*, 1692, pp. 121–3, included descriptions by Richard Waller and William Cole of specimens collected by them at Keynsham.

[39] Plot originally stated that "the *Ophiomorphit's*, or *Cornua Ammonis*, most probably formed either by two *Salts* shooting different ways, which by thwarting one another make a *Helical* Figure, just as two opposite Winds or Waters make a *Turbo;* or else by some simple, yet unknown *Salt*, that affects such a Figure" (*Oxfordshire*, 1677, p. 123; 2nd Edn., 1705, p. 124). Strachey repeats this sentence at the end of the next paragraph.

[40] Taken from Plot's *Oxfordshire:* "That *Salts* are the principal Ingredients of *Stones*, I think has so sufficiently been noted already, that to endeavour any further Evidence of the *thing*, would be *actum agere* in me, and loss of time to the *Reader:* And if of *Stones* in general, much rather sure of *Formed Stones*, it being the undoubted Prerogative of the *Saline* Principle to give Bodies their *Figure*, as well as *Solidity* and *Duration:* No other Principle that we yet know of naturally shooting into *Figures*, each peculiar to their own kind, but *Salts;* thus *Nitre* always shoots into *Pyramids*, *salt Marine* into *Cubes*, *Alum* into *Octo*, and *Sal Armoniac* into *Hexaedrums*, and other mixt *Salts* into as mixt *Figures*.

Of these spontaneous Inclinations of *Salts*, each peculiar to its *Kind*, we have further Evidence in the Chymical Anatomy of *Animals*, particularly in the *Volatile Salt* of *Harts-horn*, which in the Beginning of its Ascent is always seen branched in the Head of the *Cucurbit* like the Natural *Horn*. And we were told by the very Ingenious and Learned *Sidleyan Professor* here in *Oxon*, That the *Salt* of *Vipers* ascends in like manner, and shoots into *Shapes* somewhat like those *Animals*, placed orderly in the *Glass*" (*Oxfordshire*, 1677, p. 122; 2nd Edn., 1705, p. 123).

[41] Timsbery, near High Littleton.

[42] Probably Banwell.

[43] Presumably Hamdon Hill.

[44] Draycott.

[45] See footnote 13.

[46] List of stones omitted.

[47] North of Cheddar.

[48] Lamb's Lair Cavern. An earlier and much more complete description of the cavern is given by Beaumont in the *Philosophical Collections* of the Royal Society, 1681, pp. 4–5.

[49] Tedbury camp.

[50] These remarks come from Fuller, who in 1662 stated: "Plenty hereof is also found in Mendip hills; and it is much used in physic (being very good, as artificially ordered, for the clearing of the sight), and more by metallists; for brass, no original, but a compound metal, is made of this stone and copper; and becometh more hard than copper alone, and therefore the more serviceable for many other purposes . . . it was first discovered in this county in that juncture of time when the copper mines were newly re-discovered in Cumberland . . ." (*Worthies of England*, 1840, **3**, p. 86). Anderson lists 1561 as the year when a copper mine and Lapis Calaminaris (calamine) were found in Cumberland (*Monthly Review*, 1764, p. 175). Gough mentions that calamine was mined at Worle in 1566 (*Mines of Mendip*, 1930, p. 210).

[51] Brown observes in a Lapis Calaminaris mine about 6 miles from Aachen that

after the "*washing* of the *Ore* or *Stone* . . . the most remarkable *work* is the *calcining* of the *Ore* . . . and it is worth the seeing; for they place *Faggots* in a handsome order first, and cover a large *Area* with them, of about Forty or Fifty yards *Diameter*, upon which they place *Charcoal* in as good an order, till all be covered and filled up a yard from the ground; then they place ranks of the largest *Stones* of *Calmey*, and after them smaller, till they have laid all on; and then by setting *fire* to the *bottom*, the *fire* comes to each *stone*, and all is handsomely *calcined*." *Account of Several Travels Through . . . Germany*, 1677, p. 164.

[52] Pooley describes the type of 'Oven' used in preparing Lapis Calaminaris on the Mendip Hills (*Phil. Trans.*, 1693, p. 676).

[53] Brown originally observed that in making brass "They take calcined *Cadmia*, or *Calmey*, as they call it, *Copper* from *Sweden*, and the melted dross of both; to twenty-eight pounds of *Copper* they put an hundred pound of *Calmey:* They put first into very large *Crucibles*, some old pieces of *brass* and *slacken*, or the dross, and afterwards the *Calmey* and *Copper*, and let them stand in the Furnace twelve hours; after which, they put eight *Crucibles* full into one, and let what will run over, the best sinking always to the bottom; and then cast it into a Frame made of stone, bordered with bars of Iron; and so run it into brass Plates . . . " *Account of Several Travels Through . . . Germany*, 1677, pp. 160–1.

[54] Quoted from the first series of abridgments of the *Philosophical Transactions*. Aachen has been variously referred to as Aken, Aquisgranum or Aix la Chapelle.

[55] This belief is also mentioned by Pooley (*Phil. Trans.*, 1693, p. 673).

[56] The poem, originally composed by Edward Manlove, a steward of the Barge-moot court for the lead mines in the Wapentake of Wirksworth in Derbyshire, is as follows:

> "Bunnings, polings, stemples, forks, and slydder,
> Stoprice, yokings, soletrees, roach and rider,
> Water holes, wind holes, veyns, coe-shafts, and woughs,
> Maine rakes, cross rakes, brown henns, buddles, and soughs,
> Break-offs, and buckers, randum of the rake,
> Freeings, and chasing of the stole to th' stake,
> Starting of ore, smelting, and driving drifts,
> Prim-gaps, roof-works, flat-works, pipe-works, shifts,
> Cauke, spar, lid-stones, twitches, daulings, and pees,
> Fell, bous, and knock-bark, forstid-oak and tees,
> Bing place, barmoot court, barge master and stowes,
> Crosses, holes, hang-benches, turntree and coes,
> Founder-meers, taker-meers, lot, cope, and sumps.
> Stickings, and stringes of oar, wash-oar, and pumps,
> Corfe, clivies, deads, meers, groves, rake-soil the gange,
> Binge-oar, a spindle, a lampturne, a fange,
> Fleaks, knockings, coestid, trunks, and sparks of oar,
> Sole of the rake, smitham, and many more."

(Quoted from Fuller, *Worthies of England*,
1840, **1**, p. 366).

[57] Taken from Fuller: "Plenty of the best . . . is digged out of Mendip hills. Indeed it is not so soft, pliant, and equally fusile, as that in Derbyshire; not so proper for sheeting, because, when melted, it runs into knots, and therefore little known to, and less used by, our London plumbers, for, being of a harder nature, it is generally transported beyond the seas, and employed to make bullets and shot, for which purpose it is excellent." (*Worthies of England*, 1840, **3**, p. 85). Gough mentions that Mendip lead is especially suitable for making shot because of its arsenic content. It was used when available in the Shot Tower of Redcliff Street, Bristol, during the nineteenth century (*Mines of Mendip*, 1930, p. 178).

[58] Also from Fuller: "It is almost incredible what great sums were advanced to the bishops of Bath and Wells by the benefit of lead, since the latter end of queen Elizabeth. Bishop Still is said to have had the harvest, bishop Montague the

gleanings, bishop Lake the stubble thereof; and yet considerable was the profit of lead to him and his successors." (*Worthies of England*, 1840, **3**, p. 85). Still was Bishop of Bath and Wells from 1592–1607, Montague, from 1608–1616, and Lake, from 1616–1626. Fuller thus records a drop in production of lead in the Priddy mineries (Wells Liberty), which belonged to the Bishop of Bath and Wells. There was a similar fall in production over the same period (1600–1630) in the adjoining Chewton Liberty (see Green, 1958, p. 86). Fuller's statements (also note 57) are repeated in Cox's *Magna Britannia*, 1727, **4**, p. 834. Vellacott (*in* Page, *The Victoria History of Somerset*, 1911, **2**, pp. 374, 378) has attributed Fuller's statements (including note 57) to Strachey.

[59] Sir Richard Chocke, son of John Chocke, of Long Ashton was made a Justice of Common Pleas on the accession of Edward IV to the throne in 1461, and he continued in this capacity through the succeeding reigns of Henry VI, Edward IV and Edward V. He died in 1483, in the first year of Richard III. According to Gough (1930), Sir Richard Chocke merely settled a dispute on the rights of the common for grazing purposes in Edward IV's reign, and it was not directly connected with mining. Gough believes the Mendip mining customs are of great antiquity; they "were not written down as a definite code until the reign of Queen Mary" (p. 82). The association of Sir Richard Chocke's name with the mining laws is thought to have resulted from the inscription of laws on mining and pasture together in court-books and on maps of Mendip. By the seventeenth century the association had already become firmly established. Vellacott also gives an account of the Mendip mining disputes (*in* Page, *Victoria History of Somerset*, 1911, **2**, pp. 362-79).

[60] This passage may have been taken from Gibson's addition to Camden's *Britannia*, 1722, p. 82: "The Groviers (for so the Miners are call'd, as the pits they sink are call'd *Groves*) living at some distance, leave their tools, and the oar they have got, sometimes open upon the hill, or at most only shut-up in a slight hutt. Whoever among them steals any thing, and is found guilty, is thus punish'd: He is shut up in a hutt, and then dry fearn, furzes, and such other combustible matter, is put round it, and fire set to it. When it is on fire, the Criminal who has his hands and feet at liberty, may with them (if he can) break down his hutt, and, making himself a passage out of it, get free and be gone; but he must never come to work, nor have to do any more, on the hill. This they call *Burning of the hill*." Listed as Item 6 in the code of Mendip mining laws (see Gough, 1930).

[61] An uncompleted sentence here has been moved to a more appropriate place following the mention of Mr. Robinson's work at Cavan Vaughan in the next paragraph but one.

[62] The terminology employed up to this time for recording directions in mines. According to Plot, "about *Chedle* . . . the coal *dips* S.W. and by S. or as the Miners call it to the two a Clock-Sun." (*Staffordshire*, 1686, p. 131). Brown observed that "the Miners" at Chemnitz "direct themselves under ground by a Compass, not of 32 points (such as is us'd at Sea) but by one of 24; which they divide, as we do the hours of the day, into twice 12" (*Phil. Trans.*, 1670, p. 1194). See also discussion on mining compasses in Agricola's *De Re Metallica*, edited by Hoover and Hoover, 1950, p. 57.

[63] In an earlier, loose manuscript accompanying Strachey's own annotated copy of the *Observations* (DD/SH 366, housed in Somerset Record Office), the following note is added in the margin beside this same passage: "& in flyntshire, Denbigh, Darby & Yorkshire Lyes under a Limestone Cover but in Montgomery & Caernarvan there is instead of Limestone an hard Iron Rock." It may be substituted for the phrase "but seldom a Solid Rock over."

[64] The observations come from a description of diamond mines by the Earl Marshal of England (Duke of Norfolk) in 1677. "Quotara" is a mis-spelling of the locality referred to as "Quolure" by the Earl Marshal. This seems to be Kollur, a famous locality for diamonds lying on the right bank of the Krishna River in the Guntur district. Malabar is on the south-west coast.

[65] This paragraph is interpolated here as in the earlier, loose manuscript

accompanying Strachey's annotated copy of the *Observations* (DD/SH 366). It adds some fresh details on the relationship between seams of coal and veins of lead.

[66] 5 miles west of Wrexham.

[67] Alyn, a tributary of the Dee.

[68] Near Mold.

[69] 1 mile south-east of Llanferres.

[70] According to Leland, "Ther were of ancient tyme 4. comptyd as chefe Lords of Mendepe. First the Kynge, and his Parte cam to the Bysshope of Bathe as by a Fee Ferme. *Glastenbyre* had a nothar Parte. *Bonvill* Lord of *Bonvile*, and now *Graye* Lord Marques of Dorset was the third Owner. The fourthe was *Gurney*, now Caradoc, alias *Newton*." (*Itinerary*, 1745, **7**, Part 2, p. 82). Gough considers that Leland rightly observed that there were four Lords Royal, but some of the details about individuals were in error (*Mines of Mendip*, 1930, p. 87).

[71] Priddy, north-north-west of Wells.

[72] North-east of Cheddar. The mines at Charterhouse were first worked during the Roman occupation (Eichholz, in *Bristol and its Adjoining Counties*, 1955, pp. 175-6). From the twelfth century to the Reformation Carthusian monks from Witham had grants of land on Mendip for grazing, and later for mining at Charterhouse. Gough infers that the Lord Royal was attached to Charterhouse (i.e., Witham), rather than Glastonbury, during this period, a view he shares, though probably for different reasons, with Strachey. On the dissolution of Witham by Henry VIII, Charterhouse went to Robert May, and it remained in the May family to the end of Elizabeth's reign. Sir Thomas Gore was Lord Royal of Charterhouse in 1675, and it was retained by the Gore family at least until 1756. The mines at Charterhouse were also known as West mineries, the West Liberty (Gough, *Mines of Mendip*, 1930, pp. 89–91).

[73] East of Lamb's Lair Cavern, in the Harptree Liberty. There "Mineryes" are shown on Strachey's map (Plate VIII). Presumably Priddy and Chewton are combined since they occur close together.

[74] Near Stogumber, west Somerset.

[75] Talargoch Mine is between Dyserth and Meliden, north-north-east of St. Asaph, Flintshire.

[76] Esgairhir or Estkyrkyr is 3–4 miles east of Talybont. Strachey's observations are apparently taken from William Waller's report on the Cardiganshire mines about 1700. A copy of Waller's map is reproduced in Hunt's account (1848) of the history of the lead mines.

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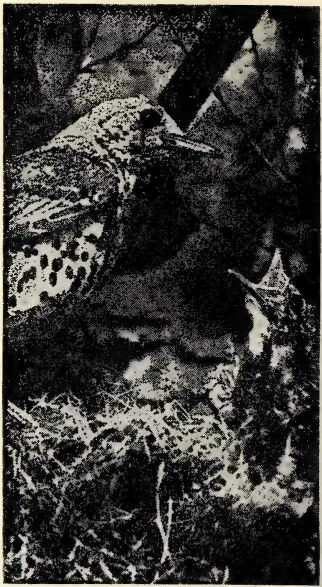

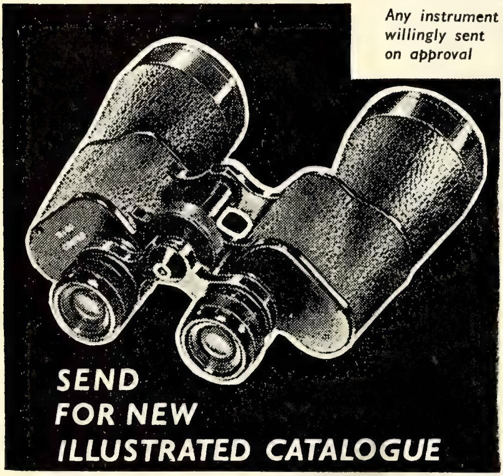

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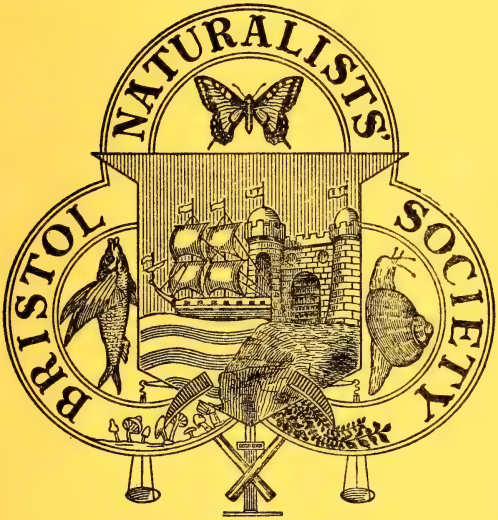

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	Ghani, K., B.Sc.	The City Museum, Queen's Road, Bristol 8
	Gill, D. A.	Lake View, Chew Stoke, nr. Bristol
	Gill, Mrs. D. A.	Do.
	Hall, R. J. W.	29 Caledonia Place, Clifton, Bristol 8

	Hammersley, Mrs. E. L.	68 Bromley Heath Road, Downend, Bristol
	Harman, Miss E. M.	215 Canford Lane, Westbury-on-Trym, Bristol
	Heckels, Miss A., B.Sc.	5 Princes Buildings, Clifton, Bristol 8
	Heslop, Miss J. E.	Belfield, Poplar Road, Burnham-on-Sea, Somerset
	Hill-Cottingham, Mrs. M. P., B.Sc., M.I.Biol.	36 Station Road, Backwell, nr. Bristol
	Hobbs, Miss S. V.	11 Eastwood Road, Brislington, Bristol 4
	Hudson, Professor J. P., M.B.E., G.M., M.Sc., Ph.D.	Research Station, Long Ashton, Bristol
A.	Jenkins, Miss S. M.	67 Thingwall Park, Fishponds, Bristol
	Kendall, Mrs. B., B.Sc., Dip. Ed.	The Garden Flat, 2 Rockleaze Avenue, Sneyd Park, Bristol 9
	King, R. W. H.	49 Tabernacle Road, Hanham, Bristol
	Koritnik, Miss L. A., Dr. Ph.	16 Bayswater Avenue, Redland, Bristol 6
	Langdon, G. J.	14 St. Aubins Avenue, Broomhill, Bristol 4
A.	Lee, C. P., B.Sc.	5 Gordon Road, Clifton, Bristol 8
	Lewis, Mrs. G. E.	11 Gratitude Road, Greenbank, Bristol 5
	Liell, D. C.	65 Park Street, Bristol 1
A.	Limentani, J. D.	79 Abbey Road, Westbury-on-Trym, Bristol
	Lockyer, Miss A. E.	36 Woodside Road, St. Anne's Park, Bristol 4
	McGivan, A.	13 Derby Road, Bristol 7
	McGivan, Mrs. N.	Do.
	McOmie, Dr. J. F. W., M.A., D. Phil., D.Sc.	16 Richmond Hill, Clifton, Bristol 8
	Merchant, Miss E. M.	14 Merfield Road, Knowle, Bristol 4
A.	Milburn, O.	15 Northover Road, Westbury-on-Trym, Bristol
	Nealon, M.	18 Church Road, Stoke Bishop, Bristol 9
	Oram, Miss E. M.	6 Arbutus Drive, Bristol 9
	Palmer, A.	Woodland Bungalow, Abbots Leigh, Bristol
	Parker, Miss S., B.Sc.	10 Cavendish Place, Bath, Somerset
A.	Pocock, Miss B.	Mill House, Chew Magna, nr. Bristol
	Pople, R. C.	71 Berkeley Road, Fishponds, Bristol
	Porter, D. J., B.Sc., L.R.I.C.	13 Richmond Avenue, Montpelier, Bristol 6
	Price, Mrs. G.	17 New Fosseway Road, Bristol 4
	Rees, Miss E. M.	25 Tyndall's Park Road, Clifton, Bristol 8
	Rogers, Miss A. C.	4 Collingwood Road, Redland, Bristol 6
	Selway, Mrs. E. J.	The Orchard, Blagdon, nr. Bristol
	Simmonds, J. H. G.	9 Rayens Cross Road, Long Ashton, Bristol
	Simmonds, Mrs. J. H. G.	Do.
	Slowley, Miss C. H.	113 Monks Park Avenue, Horfield, Bristol 7
	Spittal, C. J.	The Shieling, 162 Church Road, Frampton Cotterell, nr. Bristol
	Spittal, Mrs. C. J.	Do.
	Stamp, Miss P. W.	8 West Park, Clifton, Bristol 8
	Stenner, J. W.	Injebeck, Warren Lane, Long Ashton, Bristol
	Stenner, Mrs. J. W.	Do.
A.	Stickler, P. D.	48 Bishopsworth Road, Bedminster Down, Bristol 3

	Stiles, Mrs. D. M.	41 Highdale Avenue, Clevedon, Somerset
	Swales, Miss R. D., S.R.N., S.C.M.	14 Cambridge Park, Redland, Bristol 6
	Symes, Mrs. R. G.	58 Seymour Avenue, Bishopston, Bristol 7
	Taylor, Mrs. M. O	40 Kensington Park Road, Brislington, Bristol 4
	Thomas, Dr. A. E., B.Sc., M.R.C.S., L.R.C.P.	501 Bishport Avenue, Bristol 3
	Tilsley, Mrs. D. V.	1 Lower Linden Road, Clevedon, Somerset
	Tonkin, Miss N., M.C.S.P.	12 Lyndhurst Road, Westbury-on-Trym, Bristol
	Tovey, Mrs. J. L.	Tockington Manor, Tockington, nr. Bristol
	Treasure, Mrs. M. L.	100 Church Road, Bishopsworth, Bristol 3
	Turner, Mrs. M.	25 Conygar Close, Clevedon, Somerset
	Watson, Miss B. J.	8 Downs Cote Park, Westbury-on-Trym, Bristol
	Weeks, H.	Mountain Ash Farm, Bishop Sutton, nr. Bristol
	Weeks, Mrs. H.	Do.
	Westcott, Miss I. M., B.A., B. Litt.	20 Linden Road, Redland, Bristol 6
	White, Miss C. M.	Woodlands Farm, Abson, Wick, nr. Bristol
	Whiteley, T. G.	8 Glaisdale Road, Fishponds, Bristol
A.	Widgery, R. P.	181 Park Road, Keynsham, nr. Bristol
	Wilkins, Mrs. I.	25 St. Alban's Road, Westbury Park, Bristol 6
	Williams, W.	14 Wellington Hill, Horfield, Bristol 7
	Williams, Mrs. W.	Do.
	Willson, Miss A. Wynne	The Mount, Long Ashton, Bristol
	Wilson, Miss A.	Seawinds, 89 Nore Road, Portishead, nr. Bristol
	Wright, Miss P. A.	29 West Mall, Clifton, Bristol 8
	Youde, A. J.	4A Alexandra Road, Clevedon, Somerset

CHANGES OF ADDRESS

	Barrett, J. H.	9 West Parade, Sea Mills, Bristol
C.	Boyd, H.	1032, Pinewood Crescent, Ottawa 14, Canada
A.	Brown, B. J. H.	The Chase, Bishop's Road, Cleeve, nr. Bristol
	Brown, Miss D. E.	26 Goldney Road, Clifton, Bristol 8
	Campbell, Mrs. J. E.	Flat 4 Westward, Long Ashton, Bristol
	Clothier, G. E.	7 The Crescent, Backwell, nr. Bristol
H.	Davis, H. H., M.B.O.U.	Gordano, Church Road, Winscombe, Somerset
	Davis, Mrs. H. H.	Do.

	Everett, Miss P. S.	80 Parry's Lane, Stoke Bishop, Bristol 9
	Graham, Miss C. D. G.	81 Redland Road, Redland, Bristol 6
	Graham, Miss V. E.	Do.
	Hack, Mrs. M. W.	Myrtle Hall, Hung Road, Shirehampton, Bristol
	Harper, Miss R. J.	9 Crawley Hill, Uley, Dursley, Gloucestershire
	Hawkins, A.B., B.Sc., F.G.S.	Winifred Cottage, Oxleaze Lane, Dundry, Bristol
	Hughes-Games, Dr. J. S., M.B., Ch.B.	Bridge Cottage, Half Acre Close, Whitchurch, Bristol
	Hurrell, Miss L. E.	Moorgate, South Brent, South Devon
	Jones, Miss B. E., B.Sc.	Verdons, Sutton, nr. Newport, Shropshire
C.	Locke, S.	The Curtis Museum, Alton, Hampshire
	McLeod, Dr. J.	63 Woodhill Road, Portishead, nr. Bristol
	Morgan, J. S.	139 Wellsway, Keynsham, nr. Bristol
	Niblett, E. G. M.	Woodlands, Woodlands Road, Portishead, nr. Bristol
	Parry-Jones, J., Wing-Cdr., M.Eng., A.F.R.Ae.S.	10 Nithsdale Road, Weston-super-Mare, Somerset
	Phillips, Professor F. Coles, M.A., Ph.D., F.G.S.	Wains' Way, Meerut Rd., Brockenhurst, Hampshire
	Pugsley, Professor Sir Alfred, O.B.E., D.Sc., F.R.S.	4 Harley Court, Clifton Down, Bristol 8
	Pugsley, Lady	Do.
A.	Rabbitts, B. A.	4 Longwood, Broomhill Road, Brislington, Bristol 4
	Rogers, Mrs. M. J., M.A.	Woodlands Farm, Abson, Wick, nr. Bristol
	Wallington, Miss J.	16 Heathfield Road, Nailsea, nr. Bristol
	Wallington, W. A.	Do.
	Wareham, Miss C. A. L.	42 Dark Lane, Backwell, nr. Bristol
	Wareham, Miss F. H. E.	Do.
	Wills, H. H. F.	44 Falcondale Road, Westbury-on-Trym, Bristol
	Winchester, Miss D. E.	72 Westleigh Park, Hengrove, Bristol 4

REPORT OF COUNCIL

1967

THE membership at the end of the year was 758, including 69 juniors, showing an increase which is most gratifying. There are 17 affiliated societies.

At the Annual General Meeting the Officers and Members of Council were elected with F. R. Sterne continuing as President. The lectures and expeditions were well supported and the Annual Dinner was again appreciated in the Senior Common Room of the University. A very successful meeting was held in the Colston Hall in September, in conjunction with the Council for Nature, when the film *The life of the Kingfisher* was shown with two other nature films, introduced by Mr. Peter Scott.

During the year the youngest Section, the Mammal, has had some well supported and enjoyable meetings; considerable interest has also been shown this year in reptiles and amphibians. The Junior Section has become revitalized and is now very active and flourishing, thanks largely to Miss L. E. Hurrell. Miss Hurrell has gone to Reading but has been admirably succeeded by Dr. C. E. D. Smith and Miss D. M. Bussell. Mr. and Mrs. H. G. Hockey have given considerable support to this very important Section.

This year the Conservation Committee has assisted conservation at Charterhouse, Goblin Combe and Crook Peak, and its work has been especially directed towards the reports on "special areas" under survey. We welcome Dr. R. A. Avery as chairman of the Committee in succession to Dr. L. C. Frost and Mr. C. G. Trapnell as a committee member.

The President, F. R. Sterne, and Vice-President, H. G. Hockey, attended a conference at Birmingham called by the Inland Waterways Association on the future of canals. The President also represented the Society at the centenary celebrations of the Cardiff Naturalists' Society in September, and was appreciative of their magnificent hospitality. The wish was expressed that joint meetings be reciprocated more often between the two Societies.

With deep regret we record the deaths of the following members: Mrs. E. S. Clement, Mr. J. E. Cowley, Mr. E. G. Foster, Cdr. R. Dudley-Smith, and Mr. P. A. Soyer.

GWYNNETH STERNE, *Hon. Secretary.*

REPORT OF ENTOMOLOGICAL SECTION

1967

THE Annual Business Meeting was held on 10 January, when the following were elected: President, Mr. K. H. Poole; Secretary, Mr. P. F. Bird; Assistant Secretary, Mr. D. J. Foxwell; Committee, Mrs. A. J. Hollowell, Messrs. C. S. H. Blathwayt, A. D. R. Brown, J. F. Burton, D. G. Gibb, J. G. Gibb, M. Kendall, T. B. Silcocks, N. A. Watkins.

During 1967 the following meetings were held:

Feb. 7:	Entomological films.
Mar. 7:	Entomological films.
June 10:	Field meeting, Charterhouse-on-Mendip. Mr. D. J. Foxwell.
July 8:	Field meeting, Walton-in-Gordano. Messrs. K. T. Batty and D. G. Gibb.
July 22:	Worldwide Butterflies Ltd., Sherborne.
Aug. 19:	Field meeting, light-trapping, Walton-in-Gordano.
Oct. 17:	An Entomologist in America, by Mr. R. W. J. Henderson.
Nov. 14:	Annual Exhibition and Conversazione at the City Museum.

P. F. BIRD, *Hon. Secretary.*

The Hon. Treasurer in Account with the Bristol Naturalists' Society

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31 DECEMBER, 1967

Dr.

1966 £ s. d.			£ s. d.	£ s. d.	£ s. d.
612 2 0	To Members' Subscriptions: Full Members	1966	8 15 0		
		1967	621 11 0		
		1968	16 12 6	646 18 6	
60 16 3	,, ,, of the same household	1966	1 5 0		
		1967	61 12 6		
		1968	12 6	63 10 0	
14 7 6	Corresponding Members	1967	13 2 6		
		1968	3 2 6	16 5 0	
15 12 6	Associates	1967	20 10 0		
		1968	1 17 6	22 7 6	
22 15 0	Juniors	1967	25 15 6		
		1968	1 17 6	27 13 0	
21 10 0	Affiliated Societies	1966	1 5 0		
		1967	22 15 0		
		1968	2 10 0	26 10 0	803 4 0
747 3 3					
	,, *Proceedings* (1966):				
	Grants, authors' contributions		108 0 0		
	Separates		37 15 2		
	Subscribers (1965)		7 4 0		
	Advertisements		28 0 0		
224 17 5	Sales of Publications		5 11 11		186 11 1
972 0 8					
– – –	,, Field Committee surplus over expenses				7 2 0
11 0	,, Sale of Badges				2 9
5 6	,, Profit on dinner				1 2 0
3 3 6	,, Interest on deposit in Post Office Savings Bank				2 8 4
23 15 9	,, ,, ,, Defence Bonds and National Development Bonds and premium on conversion				33 8 5
999 16 5					1,033 18 7
12 6	,, Members' contributions to "Harry Savory" Fund				12 6
	,, Film show takings, less part of expenses				280 7 6
655 18 8	,, Balance from last account				646 15 5
£1,656 7 7					£1,961 14 0

P. J. M. NETHERCOTT, *Hon. Treasurer*,

Cr.

1966 £ s. d.		£ s. d.	£ s. d.
139 1 5	By General Printing and Stationery	161 16 7	
132 2 7	,, Postages and telephone	125 13 0	
3 2 6	,, Cheque books, etc.	1 0 0	
12 0 0	,, Clerical assistance	12 0 0	300 9 7
286 6 6			
487 11 4	,, *Proceedings* (1966, including separates)		489 16 9
15 15 6	,, Books	32 2 0	
29 5 0	,, Bookbinding	– – –	
30 10 6	,, Periodicals	39 16 6	
1 0	,, Rent (of library room)	1 0	
4 19 0	,, Fire insurance (library)	4 19 0	76 18
	,, Subscriptions:		
2 10 0	Council for Nature, etc.	3 5 0	
3 13 0	South Western Naturalists' Union	– – –	
18 0 0	Steep Holm Trust	– – –	3 5 0
36 9 6	,, Fares and expenses of general meetings		21 18 9
5 19 0	,, Field Committee: excess expenditure		– – –
1 8 8	,, Loss on coffee service		– – –
17 3 2	,, Nature Trail in Leigh Woods		– – –
– – –	,, Purchase of Badges		36 19 6
70 0 0	,, Grants to Sections:		
	Botanical	15 0 0	
	Entomological	10 0 0	
	Geological	15 0 0	
	Mammal	25 0 0	
	Ornithological	30 0 0	
	Junior	5 0 0	100 0 0
1,009 12 2			1,029 8 1
	,, Balances to next account:		
1 5 0	Cash in hands of Hon. Treasurer	– – –	
30 7 7	*Cash in bank	307 12 9	
30 15 3	Deposit in Post Office Savings Bank	33 3 7	
200 0 0	£200 5% Defence Bonds	200 0 0	
330 0 0	*£330 5% National Development Bonds	330 0 0	
54 7 7	In hands of Field Committee	61 9 7	932 5 11
£1,656 7 7			£1,961 14 0

*Including the "Harry Savory" Illustrations Fund £36 9s. 6d.

NOTE.—The accounts do not record balances held by sectional treasurers and the Ornithological Section Special Fund of £70 7s. 0d.

Audited and found correct, A. E. BILLETT, *Hon. Auditor*,
23 January, 1968.

REPORT OF BOTANICAL SECTION
1967

AT the Annual Business Meeting in the Small Geology Lecture Theatre of the University on 23 January, 1967, the following officers were elected: President, Dr. T. E. T. Bond; Secretary and Treasurer, Miss I. F. Gravestock; Committee: Mrs. C. H. Cummins, Dr A. F. Devonshire, Mr. J. A. Eatough, Dr. R. M. Harley, Mr. P. J. M. Nethercott, Miss A. M. Sampson, Dr. C. E. D. Smith, and Mrs. N. Vaughan Davies.

The Wild Plant table at the Bristol Museum continued to be much appreciated; thanks are offered to Mr. A. Warhurst and Mr. P. F. Bird of the Museum and to Mr. E. S. Smith and Mrs. C. H. Cummins as well as to all members who contributed specimens.

The following winter meetings were held during the year:

Jan. 23: Annual Business Meeting, followed by Members' Evening.
Feb. 27: A Botanical Trip to Morocco, by Dr. R. M. Harley.
Oct. 23: Members' Evening, with transparencies.
Nov. 27: Cotswold Grasslands, by Mr. D. M. Barling, M.Sc.

The following field excursions took place, under the leadership of those shown:

Mar. 11: Mosses, trees and birds: Draycott Moor and Ebbor Gorge. Joint Botanical and General meeting. Mrs. J. Appleyard and Mr. H. G. Hockey.
Apr. 30: Flax Bourton Combe (including a fungus foray). Dr. T. E. T. Bond and Dr. A. F. Devonshire.
May 10: Blaise Woods. Miss A. M. Sampson.
May 18: Vine House, Henbury, by kind permission of Prof. T. F. Hewer.
May 20: Farleigh Combe. Mrs. N. Vaughan Davies.
June 17: Kenfig Burrows. Mr. P. J. M. Nethercott. Many interesting plants found, including *Liparis loeselii*, *Calystegia soldanella*, *Ophioglossum vulgatum*, *Baldellia ranunculoides*, and some beautiful colour variations in *Dactylorhiza praetermissa*.
June 20: Knowle Hill, Chew Valley. Dr. A. F. Devonshire.
June 25: Avon Gorge. Joint meeting with North Gloucestershire Naturalists' Society. Dr. A. F. Devonshire.
July 5: Stokeleigh Forest. Dr. T. E. T. Bond.
July 18: Clapton-in-Gordano. Mr. E. S. Smith.
July 22: Steep Holm. Mr. P. J. M. Nethercott.
Aug. 5: St. George's Wharf, Portbury. Dr. R. M. Harley.
Aug. 12: Castle Combe. Mr. C. H. Cummins. *Nepeta cataria* still extant, and *Thesium humifusum* found.
Sept. 16: Beacon Hill and Fosseway. Miss I. F. Gravestock.
Oct. 8: Fungus Foray to Priddy. Mr. J. H. Kemp. *Amanita muscaria* in profusion; some of great size found.

I. F. GRAVESTOCK, *Hon. Secretary.*

HON. LIBRARIAN'S REPORT
1967

THE Society at present exchanges the Proceedings with 83 other societies or institutions, including 46 in Britain, 20 in the United States, 12 in Europe and 5 elsewhere. 11 complimentary copies are sent out.

During the year 180 books and periodicals were borrowed by 55 members, and 20 new books were ordered.

Once again most of the work was done by the Assistant Librarian and the thanks of the Society are due to her and to Mrs. Hollowell for her assistance.

R. BRADSHAW, *Hon. Librarian.*

REPORT OF GEOLOGICAL SECTION 1967

THE Annual Business Meeting of the Section was held on 12 January 1967 when the following officers were elected: President, Mr. I. H. Ford; Vice-President, Mr. R. G. Payne; Hon. Secretary, Mr. W. O. Stock; Hon. Field Secretary, Mr. D. Hamilton; Committee: Professor F. Coles Phillips and the Student President of the University Geological Society (*ex-officio*), Mr. D. Addison, Mr. K. Ashley, Mr. C. E. Leese, Mr. F. Stenhouse Ross, Dr. J. W. Cowie, Mr. R. Bradshaw, Mrs. M. Scawin. After the meeting the retiring President, Mr. R. G. Payne, gave an address on the educational value of museums. Other lecture meetings were:

Feb. 16: Mr. I. H. Ford, University of Bristol: Engineering Geology. The speaker gave a broad outline of his subject followed by specific references to famous engineering projects which ran into trouble through insufficient geological knowledge and survey. This was followed by a film on Roof Bolting in coal mines.

Mar. 16: Professor F. Coles Phillips, University of Bristol: Further thinking about Crystal Symmetry. This was a sequel to a previous lecture; Prof. Coles Phillips gave a general survey of symmetry in crystals and led up to some of the more abstract branches of the subject such as Dichromatic and Polychromatic Symmetry. This was the last time Prof. Coles Phillips was to address the Section as a member of the University since he was shortly to retire. The President of the Section, on behalf of everyone present, wished him a happy retirement.

Oct. 19: Dr. R. Goldring, University of Reading: Pre-Cambrian Fossils of Australia. Dr. Goldring's lecture was centred on the remarkable preservation of the fossils of soft-bodied animals in the deposits of the Ediacara area of the Flinders mountain range in Australia; the speaker gave his opinion that the absence of currents and the swift smothering by sediment of the animal was the cause of the preservation.

Nov. 16: Dr. S. C. Matthews, University of Bristol: The evolution of the Variscan Structure of S.W. England. Dr. Matthews set out to show how the present outcrop of rocks in South-West England was due to long-term processes in late Palaeozoic time and owed little to later changes.

The following Field Meetings took place during the year:

Apr. 29: Avon Gorge: leader, Dr. S. C. Matthews.

July 23: Site of the new Bath University; also Midford and Hinton Charterhouse; leaders, Mr. I. H. Ford and Mr. B. Hawkins.

Sept. 10: South Wales: leader, Mr. Trevor Thomas of Cardiff. This was a joint meeting with the Cardiff branch of the Geologists' Association in which an Open-Cast Coal Mine was visited together with exposures on the coast.

Oct. 1: Fossil Collecting at Hock Cliff, Fretherne and Leckhampton: leader, Dr. J. W. Murray. This was a combined excursion with the British Conchological Society.

W. O. STOCK, *Hon. Secretary.*

REPORT OF ORNITHOLOGICAL SECTION

1967

'THE WREN
THE WREN
THE KING OF
ALL BIRDS'

AT the 43rd Annual Business Meeting in January, Mr. G. A. Forrest and Mr. S. M. Taylor were elected as President and Hon. Secretary respectively, and Messrs. A. E. Billett, P. J. Chadwick, K. L. Fox, H. R. Hammacott, D. Ladhams, H. W. Neal, M. A. Ogilvie, J. F. Rowe and G. Sweet were elected as Committee members. Messrs. P. J. Chadwick, H. H. Davis, H. R. Hammacott and G. Sweet were elected to the Section's Editorial Committee.

Seven indoor meetings were held, with an average attendance of 68, the lowest (42) at the Annual Fieldwork Meeting and the highest (93) in February. The subjects and speakers were:

Jan. 18: Annual Business Meeting.
Feb. 17: Bird Censuses and Bird Communities, by Mr. K. Williamson.
Mar. 3: Annual Fieldwork Meeting.
Apr. 14: Bird-watching in Greece, by Mr. G. A. Forrest and Mr. G. Sweet.
Oct. 20: Kenn Moor and its Birds, by Mr. S. M. Taylor.
Nov. 24: Partridges, by Mr. P. Huband.
Dec. 13: Falconry, by Mr. P. Glazier.

There were field meetings at Belmont Hill (May 4), Nailsea Moor (May 23), Inglestone Common (May 31) and Exmoor (all-day, June 4). Migration watches at various coastal points were held on Sept. 23 and Oct. 22. We are grateful to those who acted as leaders and organizers for these activities. Two other field meetings planned for the winter had to be cancelled because of precautions against the spread of Foot-and-Mouth Disease.

Mr. A. E. Billett organized our participation in the B.T.O.'s national repeat enquiry into the status of the Kestrel, Barn Owl and Tawny Owl. Small numbers of members took part in the B.T.O.'s Common Bird Census and Nest Record Schemes (the latter organized for us by Mr. H. R. Hammacott), and in our local Bird-of-Prey studies, breeding-season census of Shelduck, a sample census of Rookeries and the Bristol Ringing Group.

The Survey of Bristol Birds continued under the care of Miss C. Graham. The bulk of the routine survey of the City is complete, and effort is being partly redeployed to deal with special aspects and particular habitats. A few members commenced preliminary and informal work on an ornithological survey of the Gordano Valley which, it is hoped, will make possible an assessment in due course of the effects of the motorway construction scheduled to begin in the near future. A group of botanists has been co-operating in a study of the Kenn Moor Common Bird Census area. There is room in all these projects for more workers, both skilled and beginners, and recruits are welcome.

S. M. TAYLOR, *Hon. Secretary.*

REPORT OF MAMMAL SECTION

1967

At the Annual Business Meeting on 13 Jan. 1967, the following officers were elected: President, Dr. R. J. G. Savage; Vice-President, Mr. D. J. Hughes; Secretary, Mrs. A. R. Holeton (née Chapman); Mammal Recorder, Miss B. E. Jones; Committee Members: Mr. R. M. Curber, Miss L. E. Hurrell, Mr. A. F. Jayne. After the business meeting Dr. Savage gave an illustrated talk on the Rhinogradentia, a fictitious order of mammals.

The following well-supported indoor meetings were held in 1967:

Feb. 16: *Tracks and Signs* and *The Unknown Forest:* films (by kind permission of the B.B.C. Natural History Unit).
Mar. 14: Deer and other mammals in British Forests, by Mr. A. Cadman.
Apr. 28: Fieldwork plans.
Nov. 7: Small mammals as Kestrel prey.
Nov. 21: Parasites of some small mammals, by Dr. G. I. Sharpe.
Dec. 14: *Aldabra* and *The Hard Winter of* 1962-63*:* films introduced by Dr. J. H. Sparks (B.B.C. Natural History Unit).

Field meetings included:

Feb. 5: Headlight Fox spotting. Leaders: Miss L. E. Hurrell and Mrs. A. R. Holeton.
Mar. 14: Goblin Combe (joint with Junior Section). Leaders: Mrs. A. R. Holeton and Miss L. E. Hurrell.
Apr. 16: River Boyd. Leader: Mr. A. F. Jayne.
May 6-7: Isle of Wight weekend. Leaders: Mr. O. Frazer and Mrs. A. R. Holeton. An early morning walk was rewarded by splendid views of two red squirrels.
June 4: Woodchester Park—Mammal field signs. Leader: Mr. R. Burrows.
July 16: Roe Deer. Leader: Mr. R. M. Hill.
Oct. 1: Bats. Leader: Mr. R. Ransome. The colony of Lesser Horseshoe Bats at Woodchester Park were counted and four different species distinguished by their ultrasonic characteristics using a bat detector.

The National Mammal Survey continues to be an important part of the Section's activities; Mr. Symes kindly took over the official recording when Miss Jones left Bristol. We are sorry to lose the support of Mr. Hughes who has emigrated to Canada.

A. R. HOLETON, *Hon. Secretary.*

REPORT OF JUNIOR SECTION

1967

The Council awarded full Section status to the Juniors during the year. In March Miss L. E. Hurrell moved from Bristol after three years of excellent work as Secretary, and her place was taken by a committee of Dr. C. E. D. Smith (President), Miss D. M. Bussell (Secretary), Mrs. H. G. Hockey (Membership Secretary), Mrs. A. J. Hollowell, Miss E. Lenton, and Messrs. R. M. Curber and H. G. Hockey.

An active programme was carried out in 1967, with six indoor and twelve outdoor meetings. The highlights were the April Badger watch (Miss Chapman and Miss Hurrell), and the early morning birding in Goblin Combe (M. Kendall).

In addition the Leigh Woods project involved the study of various aspects of the woods in the summer, reported at the October indoor meeting. Visits to the area have included insect trapping in September and mammal trapping during the winter. A prize for the best contribution to the study was won by the brothers P. and K. Cook.

D. M. BUSSELL, *Hon. Secretary.*

ACCOUNT OF THE GENERAL MEETINGS

1967

THE 104th Annual General Meeting was held on 19 January, the Officers and Council Members for 1967 being elected with F. R. Sterne continuing as President. The President gave an address on "The Inspiration of Nature". He told of those who influenced him in his early life and helped to mould him into a lover of all aspects of nature. Rapid sketches and recordings of birdsong augmented the colour slides shown.

On 2 Feb. Dr. A. M. G. Campbell spoke on "Jenner, Naturalist and Doctor," outlining his life in Berkeley and London. Dr. Campbell referred to the formation of a trust to preserve Jenner's cottage as a permanent museum to house a collection of his relics.

On 2 Mar. Mr. R. Gaymer gave an address on "Amphibians and Reptiles of the Seychelles". It was well illustrated with slides including some of new-found species of frogs.

On 5 Oct., in another lecture on reptiles and amphibians, Dr. R. A. Avery of the Zoology Department of the University spoke enthusiastically on British reptiles. Several members expressed interest in forming a Herpetological Group.

On 2 Nov. a talk on "Plant collecting from Morocco to the Middle East" was given by Mr. Jim Archibald. This was illustrated with beautiful colour slides of specimens collected, taken by Mrs. Archibald. Interesting habitats and the natives encountered were brilliantly commented on by the lecturer.

On 7 Dec. Miss A. E. Bennett gave us a view of South African National Parks and Game Reserves. The memory of her very interesting talk will remain for a long while.

GWYNNETH STERNE, *Hon. Secretary.*

GENERAL FIELD MEETINGS

SEVENTEEN field meetings were held during the year including joint meetings with the Botanical Section, the Bath Naturalists' Society, and the Conchological Society of Great Britain and Ireland. A Social Evening was also held. The meetings were generally well supported, two coaches being used on three occasions.

A list of the meetings with some indication of the main objects of interest is given below. A more complete account is kept in the records of the Field Committee.

Jan. 15: Steart. A shingle bank and salt marsh, both rapidly changing; coastal formation and shore birds. Hinkley Point; shore life. Mr. H. G. Hockey and Mr. J. Morley (Warden at Steart).

Mar. 4: Social Evening. An illustrated talk on "Travels in Wales" by Mr. J. Eatough.

Mar. 11: Joint meeting with Botanical Section. Draycott Moor; birds (including Bewick Swans). Ebbor Gorge; mosses and liverworts. Mr. H. G. Hockey and Mrs. J. Appleyard.

Apr. 23: Elan Valley (Birmingham reservoirs); Yspytty Cynfyn (Church and Parson's bridge); Strata Florida (ruins of Cistercian Abbey); Devil's Bridge. Spectacular scenery. Mr. H. G. Hockey.

May 21: Tal-y-Bont. A 4-mile walk by the reservoir. Miss R. C. Lee and Mrs. R. J. Lovell.

May 25: Ashton Court; many birds (including a tree-creeper at its nest) and trees (including a copper Norway Maple). Miss R. C. Lee and Mrs. R. J. Lovell.

June 11: Studland Heath; birds and plants (including *Pinguicula lusitanica*) and, at the Nature Conservancy Hut, three species of snake and two of lizard. Durlston Head; cliff birds and plants. Mr. D. A. C. Cullen.

June 15: Smitham Hill; remains of lead smelting works and a specialized flora. Herriots Bridge; several species of duck. Miss R. C. Lee and Mrs. R. J. Lovell.

July 2: Saunton Sands and Baggy Point; cliff formations, birds and plants. An attractive walled garden was also visited. Mr. H. G. Hockey.

July 10: Tidenham Chase; birds and plants of heath land including *Lilium martagon*. Mr. H. G. Hockey.

July 29: Maiden Castle; an Iron Age Fort, with the most complex ramparts in Britain, and the remains of a Roman temple; site originally occupied by a Neolithic camp. Maumbury Rings, Dorchester; a circular earthwork, in turn a Neolithic sanctuary, Roman amphitheatre and Civil War fort. Fallow deer at Stock Gayland Park. Signs of roe deer at Minterne Magna. Dr. A. F. Devonshire and Miss L. E. Hurrell.

Aug. 19: A walk from Uphill Ferry over Brean Down. Miss C. Groves.

Sept. 9: Joint meeting with Bath Naturalists' Society, Vallis Vale, near Frome; geology. Mr. F. R. Sterne.

Sept. 24: Geological formations in the Wye Valley. Quarries were visited at Plump Hill and Drybrook, and a small coal mine at Pluds. Mr. Brian Hawkins.

Sept. 30: Joint meeting with Conchological Society of Great Britain and Ireland. Goblin Combe, Cheddar Wood, Burtle Beds near Othery, a rhine near by; land, freshwater and marine molluscs (in Burtle Beds). Mr. D. Pickrell.

Oct. 7: Steart: wader watching. Mr. D. A. C. Cullen.

Oct. 13: Grwyne Fawr Valley, Black Mountains. A walk up the valley to the reservoir; birds, including many dippers; mosses, and ferns (including *Asplenium viride*). Mr. H. G. Hockey.

Nov. 19: Severn Wildfowl Trust. As well as viewing the main collection, the party saw the new Tropical House, wild geese and swans on the marshes, and a fine close-quarter view of wild-fowl on the lake from the studios. Mr. Bernard King.

A. F. DEVONSHIRE, *Hon. Field Secretary*.

ACKNOWLEDGMENT

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BRISTOL BOTANY IN 1967

By A. J. Willis

THE rather mild conditions of early winter found expression in Bristol gardens by the persistence of flowering as late as mid-January of Roses, *Ceanothus* and Antirrhinum at the same time as the first Snowdrops and Polyanthus. The mild weather continued in February and March, both sunny months, and led to early growth of vegetation which, however, subsequently suffered some check from late frosts. The period June to August was drier, sunnier, and warmer than average, 82°F. being reached during July at Long Ashton. September, however, brought wet conditions which were followed by a record rainfall in October (8.76 in.), every day being wet and flooding widespread. This heavy rainfall, coupled with a wet February and May, resulted in 4 in. more rainfall at Long Ashton than the average annual figure of about 36 inches.

New localities continue to come to light for some of the less widespread components of the flora of the Bristol area, and of special note is the discovery of a population of *Scirpus cernuus* well inland on Mendip. Also of considerable interest is the discovery of a specimen of *Koeleria vallesiana*, collected in 1773, in the Lightfoot Herbarium. Many records of the persistence of uncommon species in known localities have been made this year, in some instances the gap in the record being substantial. The continued existence, in good quantity, of *Blysmus compressus* in a marshy field on Windsor Hill, near Shepton Mallet, is noteworthy (*R.G.B.R.*), and of *Ruppia spiralis* between Brean Down and Uphill, as indicated below. Also of note is the persistence of *Acorus calamus* in the pool at Barrow Court (*A.F.D.*), of *Alopecurus bulbosus* in the salt marsh at Pill (*R.M.H.*), of *Asplenium obovatum* in Oldbury Court Woods (*D.M.S.*), of *Callitriche truncata* (flowering) at Kingston Seymour (*R.M.H.*), of *Campanula patula* at Harptree Combe (*J.A.*), of *Geranium sanguineum* at Brean Down, of *Paris quadrifolia* in small quantity in a young plantation of *Pseudotsuga* at Failand (*T.E.T.B.*), and of *Symphytum grandiflorum*, an alien Comfrey established at Wraxall (*E.S.S.*).

The Survey Group of the Society covering the Cheddar area have been able to confirm the persistence of *Geranium sanguineum* on both sides of the Gorge, although very scarce; they have also noted *Saxifraga hypnoides* in two sites and formed the opinion that the hybrid *Prunella laciniata* × *vulgaris* is more abundant than *P. laciniata*.

A pronounced change in the vegetation of a field at Tickenham as a result of wetter conditions brought about by a blocked drain has been observed by E. S. Smith who reports the dominance of *Nasturtium officinale* and invasion of the site by plants such as *Glyceria fluitans*, *Juncus articulatus* and *Myosoton aquaticum* not previously known in the field.

Mrs. I. M. Vaughan has kindly examined the collection of Roses in the Herbarium of the late Mrs. C. I. and N. Y. Sandwith housed in the Department of Botany, University of Bristol. Details of previously unreported localities for Rose varieties in the Bristol district are given in the systematic list. Mrs. Vaughan comments that in so far as the specimens in the Herbarium represent the species and varieties of *Rosa* of the N. Somt. and W. Glos. region they show a very different pattern from that of, for example, southern mid-Wales, not far distant but climatically very distinct. Mrs. Vaughan writes, ". . . the distribution of rose species seems to be governed far more by climatic than by edaphic conditions. Except for the *Rubiginosae* which have definite preferences for a dry sandy soil, they appear fairly indifferent to soil texture or pH values . . . *R. stylosa* is well represented by specimens from Somerset and Gloucester. *R. stylosa* is a true Southerner, frequent in the South-western counties and in Dorset, and quite prone to hybridise with *R. canina*."

In a study of the flora of Steep Holm, P. Bridgewater has investigated the distinctive vegetation, characteristic of the island, which is dominated by the Alexanders, *Smyrnium olusatrum*. Associated species, contributing substantially to the plant cover, are *Arctium minus*, *Conium maculatum*, *Urtica dioica*, *Glechoma hederacea* and *Senecio vulgaris*. In addition to 94 flowering plants listed by M. Skene for the island in these PROCEEDINGS for 1938, the following were also recorded:

Ranunculus sceleratus
Chelidonium majus
Coronopus didymus
Sedum reflexum
Rumex obtusifolius
Solanum dulcamara
Tripleurospermum maritimum ssp. *inodorum*
Sonchus asper

FERNS

Dryopteris filix-mas
Polypodium australe
Polypodium interjectum

BRYOPHYTES

Fissidens taxifolius
Dicranum scoparium
Grimmia pulvinata
Mnium undulatum
M. punctatum
Ulota crispa

Many new reports of Bryophytes stand to the credit of Mrs. J. Appleyard, 5 new county records for Somerset and 5 new vice-county records being made as well as a great number of further localities being discovered for less common species. Again the refinding of *Orthothecium intricatum* in a locality near Wells from which it was last recorded in 1887, and of *Tritomaria quinquedentata* near Cheddar, is of particular interest.

Names of contributors of several records are abbreviated thus:

J.A., Mrs. J. Appleyard
T.E.T.B., Dr. T. E. T. Bond
A.F.D., Dr. A. F. Devonshire
I.F.G., Miss I. F. Gravestock
R.M.H., Dr. R. M. Harley
P.J.M.N., P. J. M. Nethercott
R.G.B.R., Capt. R. G. B. Roe, R.N.
D.M.S., Dr. D. Munro Smith
E.S.S., E. S. Smith
M.C.C.S., M. C. C. Smith
A.J.W., Dr. A. J. Willis

Chelidonium majus L. With double flowers, waste ground, Staple Hill, Bristol, **G.**, *D.M.S.*

Rorippa sylvestris (L.) Bess. Border of pond, Hicks Common, Winterbourne, **G.**, *D.M.S.*

Hypericum androsaemum L. A few plants, Brockley Combe, **S.**, *A.F.D.*

Dianthus gratianopolitanus Vill. A well-established spreading colony reported by several observers on rocky outcrops on the N. side of the promontory of Sand Point, **S.**, *Dr. G. Appleyard* and *J.A.*, as well as another tuft elsewhere. Previously seen (*Dr. G. Appleyard*) in this site, but not recorded, in 1951.

Spergularia rupicola Lebel ex Le Jolis. Many plants on lawn, Anchor Head, Weston-super-Mare, **S.**, *R. M. Burton*, 1963, but absent from uninhabited headlands, so probably introduced.

Linum bienne Mill. On carboniferous limestone, Lodge Hill, Westbury-sub-Mendip, **S.**, *J.A.*

Geranium sanguineum L. White (*Flora*) recorded having seen a little of this plant on Brean Down, **S.**, in 1883, but there are no subsequent records. Its survival here is indicated by the finding of a small patch bearing 20–30 flowers, *P.J.M.N.*

Astragalus glycyphyllos L. Track, Lord's Wood, Pensford, **S.**, *J.A.*, conf. *A.J.W.*, together with white-flowered *Centaurium erythraea* Rafn.

Vicia sylvatica L. By shady lane, Woodford Hill, near Chew Stoke, **S.**, *A.F.D.*

Lathyrus sylvestris L. Hedge near Priston, **S.**, *J.A.*

Rosa canina L. var. *typica* W.-Dod f. *semiglabra* (Rip.) W.-Dod. Hedge by lane between Saltford and Keynsham, **S.**, 1921.

var. *senticosa* (Ach.) Baker. Drove of turf moor at Catcott, **S.**, 1920.

var. *globularis* (Franch.) Dum. Compton Dando, drove at Catcott, and hedge near Tickenham, **S.**, all three records for 1920.

var. *andegavensis* (Bast.) Desp. Chelvey Batch, **S.**, 1921.

var. *verticillacantha* (Mér.) Baker f. *lemaitrei* (Rip.) W.-Dod. A bush 6 feet high, Ashcott Heath, **S.**, 1942.

var. *aspernata* (Déségl.) Briggs f. *globosa* W.-Dod. In hedge by the Avon opposite Sea Mills, **S.**, 1920.

All of these roses, and those listed below, are in the Herbarium of *Mrs. C. I.* and *N. Y. Sandwith* (most were collected and determined by *N.Y.S.*). *Mrs. I. M. Vaughan* has determined or confirmed all of the specimens (see Introduction).

R. obtusifolia Desv. var. *rothschildii* (Druce) W.-Dod. Near Claverton, Bath, **S.**, 1921.

R. tomentosa Sm. var. *typica* W.-Dod. Hedge between Henbury and Brentry, **G.**, 1920.

var. *scabriuscula* Sm. Hillside, Compton Dando, **S.**, 1920.

Bupleurum rotundifolium L. Garden weed, Stoke Bishop, **G.**, *I.F.G.*

Heracleum sphondylium L. var. *angustifolium* Huds. A few plants, with linear-lanceolate leaf segments, at sides of lane near Abbots Leigh, **S.**, *T.E.T.B.*

Euphorbia amygdaloides L. A partially albino form with abnormal inflorescence, brought to school, Congresbury, **S.**, comm. *E.S.S.*, det. *A.J.W.*

Lycopsis arvensis L. A very few plants on newly made bank near Ashton Bridge, Bristol, **S.**, *A.F.D.*

Digitalis purpurea L. With white flowers, between Frenchay and Hambrook, **G.**, *P. G. Munro Smith.*

Lathraea squamaria L. Although frequent on the Somerset side of the Avon Gorge, not previously recorded on the Glos. side. A small clump on undisturbed ground in the garden of property in Sneyd Park, **G.**, *P.J.M.N.*

Orobanche minor Sm. On common land, Queen Charlton, **S.**, *J.A.*

Salvia horminoides Pourr. Lodge Hill, Westbury-sub-Mendip, **S.**, *J.A.*

Galium uliginosum L. In marshy valley south of Kilmersdon, **S.**, *R.G.B.R.*

Erigeron acer L. In plenty, Golf Course, Uphill, **S.**, *J.A.*

Ruppia spiralis L. ex Dumort. In spite of vigorous clearing of some of the ditches, still surviving in the marshland between Brean Down and Uphill, **S.**, where first recorded by Banks and Lightfoot in July 1773, *P.J.M.N.* The *Atlas of the British Flora* shows very few records of this plant for 1930 onwards.

Spiranthes spiralis (L.) Chevall. Plentiful, Lodge Hill, Westbury-sub-Mendip, **S.**, *J.A.*; also at Dolebury Warren, **S.**, *A.J.W.*

Scirpus cernuus Vahl. A number of plants, growing with *Juncus bufonius* L., in a wet hollow of fairly bare peat adjoining track, at about 1050 feet, Black Down, Mendip, **S.**, *Miss M. J. Bailey*, conf. *A.J.W.* Although on some stems the bract is longer than the inflorescence, the well-formed nuts show the distinctive features of *cernuus*, having a finely netted and not a ribbed surface. This small club-rush, which is typical of bare habitats near the sea, is very rare in Somerset; the present report provides information not only of a further locality for the plant but one a considerable distance inland.

Carex spicata Huds. In calcareous grassland, Velvet Bottom, Cheddar, and also in peaty meadow, Street Heath, **S.**, *M.C.C.S.*, conf. *R.M.H.* and *A.J.W.* Plants from both localities showed a purplish-red tint in the bracts and leaf bases.

× *Festulolium loliaceum* (Huds.) P. Fourn. With both parents, in meadow, Walton Moor, Gordano Valley, **S.**, *R.M.H.*, together with *Eleocharis uniglumis* (Link) Schult.

Puccinellia rupestris (With.) Fernald & Weatherby. Inland area of salt marsh, Pill, **S.**, *R.M.H.*, together with *Alopecurus bulbosus* Gouan.

Bromus lepidus Holmberg. Plentiful in hayfield, Easton-in-Gordano, **S.**, *R.M.H.*

B. racemosus L. Meadow below Pill, **S.**, *P.J.M.N.*

B. commutatus Schrad. Waste ground by roadside, Abbots Leigh, **S.**, *M.C.C.S.*, conf. *R.M.H.* and *A.J.W.*

Koeleria vallesiana (Honck.) Bertol. On going through the herbarium of the Rev. John Lightfoot at Kew, Dr. C. E. Hubbard found a specimen of this grass labelled "*Aira cristata*? nunc *Poa cristata*? var. *paupercula*. Weston supra mare, opposite the Isles of

Holme". The grass was gathered on Lightfoot's expedition to the West Country and Wales with Sir Joseph Banks in 1773, and Dr. Hubbard believes it to have been collected on Brean Down on 3 July 1773, at the same time as "*Cistus polifolius*" (*Helianthemum apenninum*), as described in the Rev. H. J. Riddelsdell's account of Lightfoot's visit to Wales (*J. Bot.*, **43**, 290–307, 1905). Lightfoot's plant represents the second recorded collection of *K. vallesiana* in Somerset.

In 1967 this grass was found in limestone grassland in the south-eastern part of Bleadon Hill, **S.**, *R.M.H.*, so that it is now known throughout the limestone hills from Brean Down to Shute Shelve and Fry's Hill.

Polypodium interjectum Shivas. A markedly toothed form, on soil in wood, Wraxall, **S.**, *E.S.S.*, det. *A.J.W.*

Ophioglossum vulgatum L. Knowle Hill, near Bishop Sutton, **S.**, *A.F.D.*

ALIENS. *Silene coeli-rosa* (L.) Godron. Garden weed, perhaps from bird seed, Pill, **S.**, *R.M.H.*, det. *R.M.H.* and *A.J.W.*

Geranium phaeum L. Flourishing on river bank, at some distance from house, Cleeve Wood, Downend, **G.**, *D.M.S.*

Rosa carolina L. Quarry near Wickwar, **G.**, *Mrs. C. I.* and *N. Y. Sandwith*, 1951, det. *Mrs. I. M. Vaughan*, 1967, who reports that this rose, a native of Eastern North America introduced in 1726, spreads rapidly by suckers and naturalizes readily.

Prunus domestica L. ssp. *domestica*. Fruiting on Fosseway, Beacon Hill, **S.**, *I.F.G.*

Polygonum cuspidatum Sieb. & Zucc. Vigorous patch by road, but now built over, Redland, Bristol, **G.**, *A.J.W.*

P. sachalinense F. Schmidt. Two well-established colonies adjoining road, near Portishead, **S.**, *R.M.H.*

Borago officinalis L. Amongst nettles by path, Stoke Bishop, **G.**, *Mrs. W. M. Cummins.*

Pentaglottis sempervirens (L.) Tausch. By side of Sandy Lane, Lower Failand, **S.**, *T.E.T.B.*

Lathraea clandestina L. Over an area about 30 yards long—mostly on the roots of two large willows but also associated with a well-grown Italian poplar with which it may have been introduced—on an overgrown bank near the Locks Brook, Lower Weston, Bath, **S.**, comm. *R.G.B.R.* When the bank was cleared, specimens were transferred to the roots of willow in the Botanic

Gardens, Bath. This rare root-parasite has been known in the area for some years, a previous reference to the plant being given in *Country-Side* (XVII, N. S., No. 3, p. 120, Autumn 1954). This earlier report refers to "large clusters of almost 100 spikes each by a stream in a wood, Bath (M. Gilwhite)" and suggests that laurel was the host. *Prunus laurocerasus* still grows in the area, but the usual hosts of *L. clandestina* are *Populus* and *Salix*.

Mentha longifolia (L.) Huds. × *spicata* L. A cultivated form established on downland, West Horrington, **S.**, *I.F.G.*, det. *R.M.H.*

Crocus purpureus Weston. Established on Clifton Down, Bristol, **G.**, *Mrs. V. C. B. Trewman*, det. *Mrs. F. M. Blandford*, conf. *R.M.H.* and *A.J.W.*

Dracunculus vulgaris Schott. This evil-smelling Mediterranean plant appeared in a newly-made garden of a new house, Lower Weston, Bath, **S.**, comm. *R.G.B.R.*

Briza maxima L. Grass verge of lane, near houses, Henbury, Bristol, **G.**, *Miss J. Rowe*, conf. *A.J.W.*

Aegilops cylindrica Host. A single, large plant on stony bare ground by the river bank, Welsh Back, near Bristol Bridge, **G.**, *M.C.C.S.*, det. *A.J.W.* and *R.M.H.*

BRYOPHYTES. Polytrichum aurantiacum Sw. Pine plantation, Pen Hill, Wells, **S.**, *J.A.*

Fissidens exiguus Sull. Growing with *F. minutulus* Sull. var. *minutulus* on sandstone rocks in stream, Chew Magna, **S.**, *J.A.* This new county record represents a substantial extension of the range of *F. exiguus*.

F. celticus J.A. Paton. Steep clay bank by stream between Beacon Hill and Oakhill, near Shepton Mallet, **S.**, *J.A.* A first record for v.c. 6 of this recently described species.

Archidium alternifolium (Hedw.) Mitt. Damp field by Christon Plantation, Hutton, **S.**, *J.A.*

Cynodontium bruntonii (Sm.) B., S. & G. On sandstone rock, Frenchay, **G.**, *D.M.S.*, det. *R. D. Fitzgerald.*

Dichodontium pellucidum (Hedw.) Schimp. var. *flavescens* (With.) Husn. On rocks in stream between Beacon Hill and Oakhill, near Shepton Mallet, **S.**, *J.A.* A second record for v.c. 6.

Tortula laevipila (Brid.) Schwaegr. var. *laevipiliformis* (De Not.) Limpr. More common than the type on old tree stumps, Frenchay, **G.**, *D.M.S.*

T. marginata (B. & S.) Spruce. On stones in turf, Dundry Hill, **S.**, *J.A.*

Acaulon muticum (Hedw.) C. Müll. Muddy track, margin of Peart Wood, Woolverton, **S.**, *J.A.*

Barbula reflexa (Brid.) Brid. On shaded limestone boulders, Harptree Combe, and also Worlebury, **S.**, *J.A.* New to Somerset.

B. spadicea (Mitt.) Braithw. Fruiting on wet wall, Harptree Combe, **S.**, *J.A.* A second record for v.c. 6.

Weissia microstoma (Hedw.) C. Müll. var. *brachycarpa* (Nees & Hornsch.) C. Müll. Bare places in field near Gurney Slade, **S.**, *J.A.*, 1959. A first record of this variety for Somerset.

Rhacomitrium heterostichum (Hedw.) Brid. At head of Harptree Combe, **S.**, *J.A.* Also in the Combe is *Eurhynchium schleicheri* (Hedw. f.) Lor.

R. heterostichum (Hedw.) Brid. var. *gracilescens* B., S. & G. On igneous rock outcrop, Downhead, near Shepton Mallet, **S.**, *J.A.*, 1966. New to v.c. 6.

Orthodontium lineare Schwaegr. Bury Hill, Winterbourne, **G.**, *D.M.S.*, det. *Dr. E. V. Watson*; also Oldbury Court Woods, Stapleton, **G.**, *D.M.S.*

Epipterygium tozeri (Grev.) Lindb. Earthy bank near stream, Rodney Stoke, **S.**, *J.A.* A second record for v.c. 6.

Bryum pallescens Schleich. ex Schwaegr. On the ground, in 1966, Lyncombe Hill, Bath, **S.**, *J.A.*, det. *Dr. E. V. Watson.* A first record for Somerset for this rare *Bryum.*

B. obconicum Hornsch. This rare moss was found on a wall, West Horrington, **S.**, *J.A.*, conf. *Dr. E. V. Watson.*

Zygodon conoideus (Dicks.) Hook. & Tayl. On old willow, Frenchay, **G.**, *D.M.S.*, det. *E. C. Wallace*, conf. *A. C. Crundwell.* New to v.c. 34.

Orthotrichum lyellii Hook. & Tayl. With capsules (rarely formed) on ash tree near Gurney Slade, **S.**, *J.A.*

O. tenellum Bruch ex Brid. On elm in field, Standerwick, near Beckington, **S.**, *J.A.*

Pterogonium gracile (Hedw.) Sm. Among limestone rocks, Lodge Hill, Westbury-sub-Mendip, **S.**, *J.A.* New to v.c. 6.

Habrodon perpusillus (De Not.) Lindb. On elms in field, foot of Stantonbury Hill, near Marksbury, **S.**, *J.A.* Not seen in v.c. 6 since Rev. C. H. Binstead found it near Wells in 1886.

Amblystegium varium (Hedw.) Lindb. Bean Wood, Westerleigh, **G.**, *D.M.S.*, det. *J.A.* A first record for v.c. 34.

Drepanocladus fluitans (Hedw.) Warnst. var. *falcatus* (B., S. & G.) Warnst. Westhay Moor, 1966, and on Black Down, Mendip, 1967, **S.**, *J.A.* First records of this variety in Somerset (old reports refer to the aggregate).

Hygrohypnum luridum (Hedw.) Jenn. Found in two new localities, East Harptree and Ubley, **S.**, *J.A.*

Scleropodium caespitosum (Wils.) B., S. & G. Tree by stream, Woollard **S.**, *J.A.*

S. tourretii (Brid.) L. F. Koch. Floor of old quarry, Norton's Wood, Clevedon, **S.**, *J.A.*

Orthothecium intricatum (Hartm.) B., S. & G. Refound in Dinder Wood, near Wells, **S.**, *J.A.*, where known by Rev. C. H. Binstead in 1887, although the moss is apparently suffering from drying out of the site.

Hylocomium brevirostre (Brid.) B., S. & G. With capsules (very rarely produced), Black Rock, Cheddar, **S.**, *J.A.*

Anthoceros laevis L. Stubble field near Portbury, **S.**, *J.A.* Known previously from the peat moors.

Riccia glauca L. Stubble field, on sandstone near Portbury; also field near Radstock, **S.**, *J.A.* The first records for v.c. 6.

Riccardia multifida (L.) Gray. Heathy ground, Siston Common, **G.**, *D.M.S.*, det. *Mrs. J. A. Paton.* In the same site were *Lophozia ventricosa* (Dicks.) Dum. and *Nardia scalaris* (Schrad.) Gray.

Leiocolea badensis (Gottsche) Jörg. With *Preissia quadrata* (Scop.) Nees, among carboniferous limestone rocks near Coleford, and also on oolite, Brown's Folly, Bathford Hill, near Bath, **S.**, *J.A.* Second and third records for v.c. 6.

Tritomaria quinquedentata (Huds.) Buch. Refound near Cheddar (Black Rock) where collected by W. Watson in 1920, **S.**, *J.A.*

Lophocolea fragrans (Moris & De Not.) Moris & De Not. On rock in bank of stream, Ebbor Gorge, **S.**, *J.A.* New to v.c. 6.

Cephaloziella rubella (Nees) Warnst. Frome valley, **G.**, *D.M.S.*, det. *Mrs. J. A. Paton.* Other liverworts of the valley include *Lepidozia reptans* (L.) Dum., *Diplophyllum albicans* (L.) Dum., *Scapania undulata* (L.) Dum. and *Gymnocolea inflata* (Huds.) Dum. (the last on stones of viaduct, Winterbourne).

Cephalozia bicuspidata (L.) Dum. var. *lammersiana* (Hüb.) Breidl. At base of tree in swamp by railway, Kenn, **S.**, *J.A.*, conf. *Mrs. J. A. Paton.* A second record for v.c. 6.

C. media Lindb. On stump, Christon Plantation, Hutton, **S.**, *J.A.*

Lejeunea lamacerina Gottsche ex Steph. var. *azorica* (Steph.) Greig-Smith. Frome valley, **G.**, *D.M.S.*, det. *Mrs. J. A. Paton*, conf. *Mrs. J. Fitzgerald.* New to v.c. 34.

I am indebted to Mrs. J. E. Campbell for information regarding the weather and to Mrs. J. Appleyard and Mr. P. J. M. Nethercott for help concerning the records.

BRISTOL BIRD REPORT

1967

COMPILED BY THE EDITORIAL COMMITTEE OF THE
B.N.S. ORNITHOLOGICAL SECTION

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THIS, the thirty-second Report, starts with an extended summary of the year's events, and in the systematic list maps and diagrams have been used to summarise data for some species; we hope these innovations prove useful. Any kind of summary, however, depends for its adequacy on the quality of the data, and we are very conscious of our debt to all our contributors, whom we thank warmly. The Somerset Bird Report may contain further details relevant to the district, as some records were unavailable to us.

The year. The mild weather that ended 1966 lasted well into March, and with only one really cold day and light snow on only three others, the winter was the mildest since 1960–61. The geese left the Severn early; reports of warblers and of Stonechats were unusually many; Redwing flocks were comparatively small, although numbers in S.E. England appeared to be normal—possibly the mild weather reduced the urge to move westwards—and Collared Doves and Song Thrushes were nesting in February. Some migrants were early, a lone Swallow being reported at Weston-super-Mare on Feb. 7, and Wheatears and Chiffchaffs being seen on March 4, but a cold week from April 5 held up arrivals. A Blackcap at Weston on March 14 and Sand Martins in the next two weeks were on schedule; then came a gap, and—delayed by bad weather *en route*—the main bulk of both arrived, unusually, in the second half of April with the House Martins and Swallows. The wreck of the tanker *Torrey Canyon* on March 18 caused havoc among seabirds in the S.W., but no oil came near the Bristol district; oiled birds were treated at local centres but few survived for very long.

Around May 7 and the 19th–22nd, winds from the S.–W. quarter brought a group of seabird records—Gannets, Storm Petrel, Guillemot, Razorbill and a Long-tailed Skua. Heavy rain in its second half made May the wettest since 1932 and ground-nesting birds suffered;

a dozen or so drowned Lapwing clutches were seen in the Stoke Moor area.

A sample of Severn Vale Rookeries showed an increase in occupied nests—the first since the sharp decline started about 1962. Great Crested Grebes also had a successful season, and large numbers were present at Chew Valley Lake in autumn. The ancient Brockley Heronry—so described even in 1829—was greatly reduced by tree-felling some years ago; now, unused for two years, it must be assumed extinct, but its replacement a short way off at Cleeve appears to flourish.

The Shelduck breeding season was again lengthy, with the first broods as usual in late May but others still arriving in August, after the first-comers had dispersed. Counts show this to have been the best breeding season since 1962 even though no accurate estimate of overall success was possible. Two pairs of small Lapwing chicks, found on Nailsea Moor on the late date of July 22, five weeks after post-breeding flocks had begun to assemble, were the first broods located there since 1962. Perhaps significantly, they were safely reared on the only field in the vicinity not grass-covered.

Prolonged westerly winds in August and throughout October brought many American species to the country, and four were recorded locally for the first time—Lesser Golden Plover, Lesser Yellowlegs, Baird's Sandpiper and Wilson's Phalarope—as well as our third Pectoral Sandpiper. Many seabirds came ashore, especially in a "wreck" during storms on Sept. 4–5 which scattered Manx Shearwaters newly fledged from Skokholm across the country to the far N.E. Common /Arctic Terns were numerous, and Roseate Terns at Chew and at Durleigh res. near Bridgwater were the sixth and seventh Somerset records. There were more Little Terns than usual; also a first local record of Gull-billed and a fourth of White-winged Black Tern were made.

A large passage of Curlew Sandpipers and Little Stints in mid-September brought unaccustomed numbers inland. Locally the former were not numerous, but Little Stints reached the same high level as in 1960. A Long-tailed Duck at Cheddar res. on Oct. 28 was the first seen in an influx into S. England. Others occurred at Barrow Gurney, Chew Valley and Durleigh resrs., on the Huntspill River and at Frampton-on-Severn, and some stayed into 1968. Early in November a Puffin and at least two Arctic Skuas were in the area, with a Great Northern Diver and a Slavonian Grebe at mid-month, when a Little Auk was present across the Severn.

The Bewick's Swans returned to the New Grounds with very few juveniles, suggesting a disastrous Siberian breeding season. The arrival of the Whitefronts was very late—none were present for the

Wildfowl Trust's 21st birthday party on Nov. 11—but their numbers rose rapidly in December.

Movement restrictions because of the risk of foot-and-mouth disease reduced information from November on, and year-end duck count totals in particular are less reliable than usual as, owing to the ban on access to the reservoirs, counts had to be made from the roads.

Early December was cold, and heavy snow on the 7th–9th lay until the 11th. Large weather movements took place, during which Lapwings, Golden Plovers, Skylarks, Starlings, and thrush and finch species passed over the City in some numbers.

Rarities. Besides those listed above, noteworthy records were a Red-breasted Goose and a Lesser Whitefront early in the year; a Little Crake in May; the now familiar Pied-billed Grebe; the first Red-footed Falcon for the area, in August; and a Melodious Warbler (trapped, like its predecessor in 1961, on Steep Holm) in the same month. An Alpine Swift off the island in September ends a remarkable list which includes six new species for the area, and five second or third records.

Commoner Birds. For Shelduck and Rook, prolonged local studies give a firm base for assessing status. The co-operative work on raptors started in 1964 likewise shows the numbers of Sparrowhawk, Kestrel and Tawny Owl to be satisfactory, but also the almost complete disappearance of the Barn Owl from the area. Despite comments on the Little Owl's scarcity in places, both casual reports and systematic observations show this resilient and adaptable species to be plentiful in much of the area—an instance of the value of detailed distribution studies.

A bird for which impressions are borne out is the Wren; by 1966 it had recovered well from 1963, but many reports of increases in 1967 are confirmed nationally by the B.T.O. Common Birds Census, which showed an increase of some 50% over 1966.

Some birds, like Dipper, Lesser Whitethroat, Cirl Bunting and Long-tailed Tit, with local distribution, specialised requirements or merely "uninteresting" habitats, are reported so infrequently that conclusions are hard to draw. In such cases, counts in some definite even if small area, like those given below for Tree Pipit and Corn Bunting, have great value for future reference, and more would be welcome—as, of course, would more notes of occasional sightings.

The field work for the B.T.O. Atlas of Breeding Distribution, starting in 1968, will give more data on these and other groups. There remains, however, the problem of the very commonest birds, which occur in nearly every grid square, and for which almost no records are received in the ordinary way. Thanks to the Common

Birds Census, some objective comment on these is at last possible. The most abundant farmland species—Blackbird, Chaffinch, Skylark, Dunnock and Robin, roughly in that order—are now fairly stable in numbers. The Wren's increase was mentioned above, and the Song Thrush, next in order, may have increased slightly in 1967. It is interesting, in the era of these national B.T.O. projects, to read again Reynolds' discussion, written ten years ago, of the problem of the common and unreported species (*Somerset Bird Report*, 1958, pp. 48-50).

Changes in Habits and Habitats. Records of past changes in the environment of our birds, and in their behaviour, would be valuable. In these times of rapid development, we have a duty to make what local records we can for future reference, and we hope members will help in this.

A steady loss of hedges, trees and orchards continues, and ponds are now a rarity. Herbicides have altered plant distribution. Woodland management involves a cyclic change in the habitat and its bird life which it can be instructive to follow in detail. The treatment of verges by mowing only the strip next to the road has in places added considerably to hedge bottom cover, and thus to insect food supply. In the City, Blackbirds have bred in the roof garden of a multi-storey store, and below ground in a school boiler-room; while Kestrels nested on a derelict building later demolished. Despite discouragement, Starlings roost inside Temple Meads Station, a habit started in the cold of January 1963; they have also roosted on the tall lamp masts of the new Cumberland Basin bridge complex. As the Avon loses its sewage burden, its character and its feeding bird population alter. We commend these examples to our readers for study, and shall be glad to hear of others.

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Headings **G.** and **S.** refer to South Gloucestershire and North Somerset and cover the areas defined in *Proc. B.N.S.*, 1960, p. 114.

GREAT NORTHERN DIVER *Gavia immer*

S. One, sometimes two, Cheddar res., Jan. 1–Feb. 9 (NTL, BR *et al.*). One, Chew Valley res., Jan. 4–Apr. 17 (RA, HRHL *et al.*) but two, Jan. 29 (PJC); one, Nov. 18 (RMC). Single bird, Blagdon res., Jan. 30 (AEB, HWN).

RED-THROATED DIVER *Gavia stellata*

S. One, Cheddar res., Jan. 25, 28 (NTL, EMP) found dead on 29th (DR); another, Feb. 7 (ACL).

GREAT CRESTED GREBE *Podiceps cristatus*

G. Pair reared two broods, Tortworth Lake (NJC, JH).

S. High numbers of autumn 1966 maintained, early Jan., but fell to *c.* 100–150, all resrs., by end month; this level held through successful breeding season—13 broods, Blagdon, and at least 10, Chew Valley, and two pairs reared three broods, Orchardleigh (RMC, EMP, WLR *et al.*). Autumn counts again very high—51, Blagdon and 225–250, Chew Valley, Oct. 8, 9 (PJC, RSH) increasing at latter to 296, Nov. 5 (PJC, MAW) and *c.* 330, Nov. 12 (BK) but down to 150, mid-Dec. (RSH).

SLAVONIAN GREBE *Podiceps auritus*

S. One present, Blagdon res., end 1966 remained till Apr. 15 (RA, TRC *et al.*). Second bird, Chew Valley res., Feb. 17–Apr. 16 (PC, DJP, DW *et al.*); one, probably this species, Oct. 14 (NJC) and another, Nov. 10 (RPW).

BLACK-NECKED GREBE *Podiceps nigricollis*

S. Single birds: Chew Valley res., Mar. 21, 30, July 30–Sept. 4; and Blagdon res., Oct. 8 (RH, ACL, ADL *et al.*).

LITTLE GREBE *Podiceps ruficollis*

S. Reported, all resrs., autumn and winter, and bred successfully at Blagdon (at least six broods) and Chew Valley.

PIED-BILLED GREBE *Podilymbus podiceps*

S. Chew Valley res.: bird seen in poor light, Mar. 12, possibly this species (GB, TRC); one clearly identified, May 14–Oct. 2 (EGH, RJJ, NTL, RAR *et al.*) and accepted by *Brit. Birds* Rarities Committee.

LEACH'S PETREL *Oceanodroma leucorrhoa*

S. One, Cheddar res., Oct. 29—details given (RA, JAMCG, BR).

STORM PETREL *Hydrobates pelagicus*

G. One flying over river, New Grounds, May 26, 29 (LPA).

MANX SHEARWATER *Procellaria puffinus*

G. and **S.** Three over river, New Grounds, Sept. 5 (LPA). Four brought to WT after early Sept. gales were released on 7th—possibly joined fifth bird seen that day and returned down river, since party of five reported from Sand Point on 7th (TB, WT). Juv. found, Wotton-u-Edge, Sept. 9, and released on river on 12th, had been ringed (ED 31898), Skomer Island, on 2nd (WT).

FULMAR *Fulmarus glacialis*

G. One over Estuary, New Grounds, Oct. 27 (LPA).

S. One off N. cliffs, Brean Down, June 2 (PC). One *c.* 1 mile off Weston-s-Mare, July 2, and dark-phase bird off Steep Holm, Aug. 27, 28 (S). One released Steep Holm, Sept. 23 (WT).

GANNET *Sula bassana*

G. and **S.** Slightly oiled ad. in flight over Long Ashton Res. Stn., May 26 (MAW) and first-summer bird, New Grounds, on 27th (LPA). Dead imm., Sand Bay, Aug. 12 (CRB). Reported from coast and resrs., after early Sept. gales—at least three, Sand Bay; four, Cheddar res.; two, Chew Valley res. (TB, BR *et al.*) and one or two on estuary, New Grounds (LPA). Three stranded birds taken to WT; two died but third released, Steep Holm on 23rd (WT). Freshly dead first-winter bird, Sand Bay, Oct. 6 (RA).

CORMORANT *Phalacrocorax carbo*

G. Max. coastal count—five, New Passage, Aug. 17 (RA, CAP).

S. Steep Holm: no census—max. count of 46, July 18 (S). Up to 17, Chew Valley res., Jan.–May, and 13 noted at dusk roosting in trees on Denny Isle, Mar. 27; up to 12, same res., Oct.–Dec. Smaller numbers at other reservoirs.

SHAG *Phalacrocorax aristotelis*

S. Two seen in flight close to Sand Point, Sept. 9 (RA).

BITTERN *Botaurus stellaris*

S. One, Chew Valley res., Sept. 17, Oct. 8 (RMC, NTL).

See note, p. 363, on accuracy of end-year duck counts.

MALLARD *Anas platyrhynchos*

G. and **S.** Annual population trend followed normal pattern with peak at mid-Sept. (*c.* 4,250—some 25% above Jan. level). Breeding records from Tockington, Walton and Kenn Moors, Newton Park, Rickford Combe nr. Blagdon, Blagdon and Chew Valley resrs. and Cheddar Moor.

TEAL *Anas crecca*

G. and **S.** About 1,250 counted in main Wildfowl Count areas, mid-Jan., but only *c.* 250 by mid-March. Autumn numbers rose quickly to *c.* 1,000 by mid-Sept. and *c.* 1,250 by mid-Nov., but apparently fewer in Dec.

GARGANEY *Anas querquedula*

S. Pair, Blagdon res., Apr. 15 and one or two, Aug. 6 to Oct. 8 (PJC, RMC) but party of ten, Aug. 19 (PJC). At least one pair bred, Chew Valley res. (RA, BK) and up to 25 noted in autumn (TRC, RSH *et al.*). One, Cheddar res., Aug. 15 (BR).

GADWALL *Anas strepera*

G. New Grounds: 50–60 early in year; total augmented by 20 hand-reared birds in late summer (MAO).

S. Gradual increase, Chew Valley res., to max. of 21 pairs plus 5 ♀♀, Mar. 27 (PJC *et al.*) and six broods plus 15 unattached juvs., July 15 (BK *et al.*). Pair, Blagdon res., Feb. 14, Apr. 9, 15 (ACL *et al.*). Autumn totals lower than hitherto; max., all resrs., 51, Sept. 16 (AHD, JAMCG *et al.*). One in flight, Weston Bay, Nov. 13 (BR).

WIGEON *Anas penelope*

Wintering population appears to reach its maximum level, mid-Dec. to mid-Feb., with peak about turn of year.

G. New Grounds: 1,350, Jan. 18 and 1,180, Nov. 17 (MAO).

S. Resrs. and coast: 1,050–1,100, Jan. 15, Feb. 11; 450, Mar. 11 (RA, BK *et al.*) and last seen—20, Blagdon, Apr. 15. First, autumn—two, Chew Valley, July 30 (TRJ, SJM); *c.* 250 in area, mid-Nov., but over 1,000 mid-Dec. (BR *et al.*).

PINTAIL *Anas acuta*

G. New Grounds: 320, Jan. 8; 100, Nov. 17; 175, year-end (MAO).

S. No large counts—winter max., ten, Blagdon res., Jan. 7. Last seen, Chew Valley—pair, Apr. 9 (RH)—where first birds of autumn noted—two, July 19 (RSH). Some increase, end year—15, Cheddar, Oct. 13; ten, Blagdon, Oct. 29; 12, Chew, Nov. 5, 12 (but 27 on 11th) and 17, Dec. 16 (BK, MAW *et al.*).

SHOVELER *Spatula clypeata*

G. New Grounds: 116, Jan. 8 and 150, at year-end (MAO).

S. Further increase, Chew Valley res., from 130, end-1966, to 270, Jan. 21 (RA); to 300 on 31st (SHGB *et al.*); and to 360, Feb. 5, 11

(JEA, BK *et al.*). Some variation later—none at any of the resrs., Feb. 14 (ACL) but 250, Mar. 11, 13; four or five pairs, mid-Apr. (WLR *et al.*) and two pairs, Blagdon (PJC) but no breeding records. Autumn counts, Chew Valley, include: 100, Aug. 8; 42, Oct. 8 (59, Blagdon, same day); 107, Nov. 12 and *c.* 120, Dec. 1, 2 (RA, DW *et al.*). Few records from Cheddar res., and usually less than ten birds seen, but 26, Sept. 22, and 28, Nov. 4 (BR *et al.*).

RED-CRESTED POCHARD *Netta rufina*

S. Male in eclipse plumage, Chew Valley res., July 13–Aug. 17 (GLB, NJC *et al.*). Dates suggest possible escape—Eds.

SCAUP *Aythya marila*

S. Single ♂♂ reported from Cheddar res., Jan. 3–Mar. 4; Chew Valley res., Jan. 5–Apr. 8 and July 30; and Blagdon res., Apr. 28–30. One, occasionally two, Cheddar res., Oct. 13–Nov. 18. Descriptions not always conclusive—pattern of bill colour and extent of black on tip seldom recorded—and some might refer to hybrids—Eds.

TUFTED DUCK *Aythya fuligula*

S. Resr. counts: *c.* 350, mid-Jan., falling to 180, mid-Feb. but steady rise to 450, mid-Apr.; autumn peak—385, mid-Sept., then fall to 275, mid-Nov. (RA, JAMCG, JFR *et al.*). At least 27 broods, Chew Valley—the only breeding records (RA, BK).

POCHARD *Aythya ferina*

S. Wintering population remained high in Jan. at *c.* 1,700 but dropped to 1,150 by mid-Feb.; majority had left by mid-March (TRJ, WLR *et al.*). Up to 50, Blagdon and Chew Valley resrs., April–July; one brood located at latter (BK *et al.*). Autumn total highest since 1962, with apparent peak about end Oct. to mid-Nov. of 2,000–2,500 (RA, PJC, TRC *et al.*). Highest individual count—1,500, Cheddar res., Nov. 8 (BR).

GOLDENEYE *Bucephala clangula*

S. Regular winter counts, all resrs., totalling 20–25, with *c.* 35 mid-Feb. (GWB, RJL, CEDS *et al.*). Spring peak—32, Blagdon, Apr. 15 (PJC) and 18, Chew Valley, same day (BK). Up to three, Blagdon, Cheddar and Chew Valley resrs., Oct. 15–Dec. 2 (GLB, JAMCG *et al.*) with 12 at latter, Dec. 27 (RA).

LONG-TAILED DUCK *Clangula hyemalis*

S. The bird noted, Barrow Gurney resrs., Nov.–Dec. 1966, stayed to Apr. 18 (SJM, GS *et al.*). One, Chew Valley res., Apr. 30–May 13 (RMC, PLG *et al.*). Single birds, Cheddar res., Oct. 29–Nov. 18 (JAMCG, PAR *et al.*) and Chew Valley, Nov. 2 to end year (CRB, NJC *et al.*), but two, Nov. 9 (TG), 15 (RSH). One, Barrow Gurney resrs. Nov. 5–year end (MP, PAR *et al.*).

COMMON SCOTER *Melanitta nigra*

G. Female on Estuary, New Grounds, Nov. 20 (LPA).

S. Two flocks of 14 and 8 off Brean Down, Feb. 12 (DJP). One dead on shore, Sand Bay, Sept. 17 (RA). One off Sand Point, Nov. 19 (RA) and party of nine, Nov. 26–Dec. 3 (TBS *et al.*), increasing to 11, Dec. 21–28 (RA, TB, PD, DJP *et al.*).

RED-BREASTED MERGANSER *Mergus serrator*

G. One, ♀, New Grounds, May 26 and "brownhead", Nov. 22 (LPA).

S. One, Cheddar res., Nov. 17 (BR) and two, Blagdon res., Dec. 2 (RA). Male flying N., Sand Point, Dec. 17 (TBS).

GOOSANDER *Mergus merganser*

S. Up to eight (including a pair), Chew Valley res., Jan. 1–Mar. 11 (GLB, TRC *et al.*), and one, Dec. 16 (BK *et al.*). Party of five "brownheads", Blagdon res., Feb. 22 (ACL, HWN) and one, Mar. 11 (PJC).

SMEW *Mergus albellus*

S. Pair, Chew Valley res., Jan. 4–Feb. 12 (ADL, EMP *et al.*) but two pairs, Jan. 22, Feb. 9 (RSH) and two males, Mar. 7 (PAR). Pair, Blagdon res., Mar. 4 (RMC).

NORTH AMERICAN RUDDY DUCK *Oxyura jamaicensis*

S. Party of 18 (10♂♂), Chew Valley res., Jan. 4 (TRJ, SJM), thereafter five to ten until Mar. 4 (ADL, DW *et al.*) but only one brood subsequently seen—pair with one juv., Sept. 14 (GLB); small numbers later with max. of 15–20, Dec. 16 (BK, ACL *et al.*). Three, Blagdon res., Apr. 15 and up to two pairs, five dates, Aug. 19–Nov. 6 (PJC, HWN).

SHELDUCK *Tadorna tadorna*

G. Up to 16, Avonmouth, Jan.–June (CG, NTL) and 56, Littleton-upon-Severn, Apr. 9 (AEB). Approx. 40 pairs, New Grounds; first juvs. seen, May 27, and 67 present, Aug. 18 (LPA).

S. See p. 362. Counts of 103 pulli, Avonmouth to Weston-s-Mare, June 22 and *c.* 122, July 4 (JS, TBS, SMT *et al.*). Reported, Chew Valley res., Jan.–May with max. of seven, Jan. 29 (JEA, TRJ *et al.*) and isolated records from Blagdon and Cheddar, Mar.–Apr. (RA, BR). Several records of passage birds, Cheddar res., Sept. 2–Oct. 3 (EGH *et al.*) with max. of seven, Sept. 7 (JAMCG), and one, Blagdon, Oct. 8 (PJC).

White-fronted Goose *Anser albifrons*

G. New Grounds: steady rise from 1,300 at end of 1966 to 2,800, Jan. 26, reaching a peak of 4,200, Feb. 18; 3,000 still present on Feb. 25, but rapid decline to 50 by Mar. 10, and last seen on 11th. Autumn arrivals latest on record—one, Nov. 18, increasing to six on 19th. Build-up then quicker than usual, to 200, Dec. 10; 1,220 by 12th, and 2,800, end year (WT).

S. Two, Chew Valley res., Jan. 22 (RSH). Small parties (16, 12, 9) overhead, Weston-s-Mare, Jan. 8, and 28 over Sand Bay on 9th (RA, TB). Calling heard in thick mist, Sand Point, Nov. 8 (TB). Eight over Weston-s-Mare, Dec. 3 (PC). Some 150 over Failand on 13th were probably this species (JFB).

Lesser White-fronted Goose *Anser erythropus*

G. A first-year bird with *albifrons,* New Grounds, Jan. 29 (CM) seen on many dates to Mar. 4 (WT).

Bean Goose *Anser fabalis*

G. A first-year bird, New Grounds, Jan. 26–Feb. 26 (WT).

Pinkfooted Goose *Anser brachyrhynchus*

G. The only New Grounds records are of two, Jan. 15, and a juv. on 28th and (possibly same bird) on Feb. 14, 28 (WT).

Dark-breasted Brent Goose *Branta bernicla bernicla*

G. A first-year bird, New Grounds, frequently from Feb. 10 to 18th; another, also first-year, Dec. 28 (WT).

S. Five, probably this race, Sand Bay, Jan. 9 (TB) and Feb. 12 (RA).

Canada Goose *Branta canadensis*

G. Usual flighting for food to Wildfowl Trust enclosures of birds from Frampton Gravel Pits stock. During autumn the flock (*c.* 70 strong) spent most days on the Dumbles rather than flying back to the pits (MAO).

S. Five on water, south side of Brean Down, Nov. 5 (RA, MP, PAR) seen feeding in nearby fields later in day (RA).

Red-breasted Goose *Branta ruficollis*

G. One, immature, with Whitefronts, New Grounds, Jan. 5 (GVTM), 8 (RMC), 14 (GWB, TRC, PS) was last seen on 15th; an adult, with Whitefronts, first seen Feb. 4 (LTCS), stayed to end of month—fifth and sixth New Grounds records (WT).

Mute Swan *Cygnus olor*

Breeding records: **G.**—St. George Park, Bristol (CL); and **S.**—Blagdon res., Chew Valley res., Locking Pond, nr. Weston-s-Mare and Kenn Moor (HRH, WLR *et al.*).

Bewick's Swan *Cygnus bewickii*

G. Extremely large numbers, New Grounds, Jan.–Mar. 15 and again, Nov. 9 to end of year. Peak count of 271, Jan. 13; 336 different birds identified, winter 1966/67. Autumn max. of 171, Dec. 28; 225 individuals seen by year end but only 28 juvs. (WT).

S. Seven, Cheddar res., Jan. 7, and 14, Feb. 9 (CEDS *et al.*). Thirteen, Chew Valley res., Jan. 7 increasing to 15 on 14th but only two for most of month; six throughout Feb. with another herd of 11, Mar. 4 and total of 31 on 5th (TRC, SJM, DW *et al.*). Wintering herd on Stoke Moor nr. Cheddar, increased from 11, Jan. 15 to 36 on 22nd and to 47, Feb. 4; last record—four, Mar. 12 (JAMCG, WLR, TBS); three again present, Nov. 12 but no other reports (JAMCG). Up to six, Chew Valley res., Nov. 19 to end of year with max. of 14, Dec. 14 (HRHL, NTL *et al.*).

Buzzard *Buteo buteo*

G. and **S.** Recorded all months. Pairs present in breeding season at 14 different wooded localities on Mendip and nr. Bath. Five breeding records and one probable (many observers). Five together, Wotton-u-Edge, late Feb. (JH). Single birds, Steep Holm, Sept. 23 and Westbury-on-Trym, Oct. 18.

Sparrowhawk *Accipiter nisus*

G. and **S.** For breeding information see Fig. 1A. Reports, all months, from 56 localities—16 in **G.**, including, in Bristol and suburbs, Downend, Hanham, Sea Mills, King's Weston and Clifton—

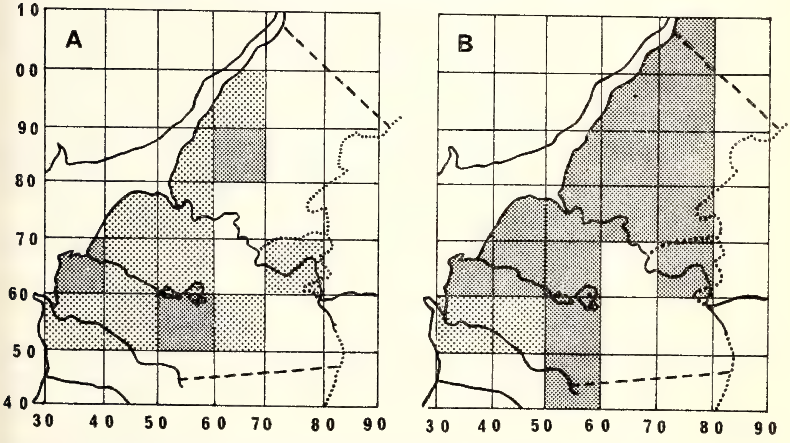

Fig. 1. *Breeding distribution of (A) Sparrowhawk and (B) Kestrel, 1967.* Parts of National Grid squares ST and SU, showing 10 km. squares. County boundaries dotted; limits of Bristol Bird Report area, pecked lines. Light shading: birds present, showing breeding behaviour; heavy shading: breeding proved, nests found.

(many observers). Ad. ♀ resident and feeding on Collared Doves, New Grounds, all year (MAO).

GOSHAWK *Accipiter gentilis*

S. One, nr. Litton, Oct. 6 seen by RSH who, in a full account, refers to size equal to that of Buzzard also present.

KITE *Milvus milvus*

S. One, mobbed by two Buzzards, nr. Hunstrete, Nov. 1 (DW). Full description mentions forked tail, angled carpus and underwing pattern.

HEN HARRIER *Circus cyaneus*

S. One, ♀ or imm., Chew Valley res., Nov. 19 (RPW) and one, probably same bird, Nov. 20 (AEB, HWN).

OSPREY *Pandion haliaetus*

S. Single birds, Chew Valley res., May 6 (RA), 7 (RJL) and Sept. 13 (DW).

HOBBY *Falco subbuteo*

G. Single birds, Wick, May 3 and two dates, Aug. and Sept. (DRH); Wotton-u-Edge, July 8 (D) and Slimbridge village, July 11 with two, Aug. 15 (LPA).

S. Pair reared two young. Pairs present and displaying in two other localities, early in season. Single birds: Steep Holm, Apr. 22 (S); Weston Woods, May 16, June 29 (RA); Downside, June 7, 18 (RSH); Chew Valley res., June 18–Sept. 17 (RMC, TRC, KEV); Rickford, June 24; Whitchurch, June 26, Sept. 26; Long Ashton, June 29, July 22 (GEC, CG); Litton, July 20 (RSH); Sand Bay, Sept. 17 and Peasedown St. John, Oct. 17 (RSH).

PEREGRINE *Falco peregrinus*

G. New Grounds: ad. ♀, Jan.–Apr. 5; 1st yr. ♂, Sept. 25–end of year; one flying over WT, Nov. 24 and ad. ♂, Dec. 31 (TRC, MAO, CEDS *et al.*). One, Sea Mills, Mar. 24 (HWN).

S. Single birds: Steep Holm, Aug. 27; juv., Sept. 16–20 (S) and Sand Point, Sept. 7, 14 (RA, PD, DJP).

MERLIN *Falco columbarius*

S. One, Widcombe, Jan. 22 (RSH) and one, Chew Valley res., Feb. 26 (RJL).

RED-FOOTED FALCON *Falco vespertinus*

S. Male, nr. Farrington Gurney, Aug. 18 seen by MHT who refers to uniform slate-grey plumage except for rusty under tail-coverts and bright red legs. Record, first for district, accepted by *Brit. Birds* Rarities Committee.

KESTREL *Falco tinnunculus*

G. and **S.** For breeding information see Fig. 1B. Some 600 reports, all months; most—84 each—in Apr. and Aug. Two pairs bred in Bristol; two young reared in warehouse, and one on ruined factory wall near Temple Meads Stn.

RED-LEGGED PARTRIDGE *Alectoris rufa*

S. Pair, Goblin Combe, May 10 (PJC) and one, June 4 (RMC). Single birds, Sand Point, Mar. 19, Apr. 8, 16, with two, Apr. 23, May 14 and hatched egg shells, June 30 (RA).

PARTRIDGE *Perdix perdix*

G. and **S.** Scarce, Marshfield (HJE). Coastal records of two, Sand Point, Mar.–Sept. with five, Sept. 14 (RA, CRB, PC *et al.*). Inland records include nest with 14 eggs, nr. Avonmouth, June 13 (CG), pair with 10 young, Nailsea Moor, July 30 (per HRH) and 15 birds, Compton Dando, Oct. 10 (RPW).

QUAIL *Coturnix coturnix*

G. Present Marshfield, but 'probably fewer than in 1966' (ZMUE); heard there, July 5 (EJL).

WATER RAIL *Rallus aquaticus*

G. One, nr. Dursley, Jan. 4 (D). Single birds, Tockington, Feb. 12 (AEB) and Brimscombe, Feb. 22 (D); two, nr. Frampton-on-Severn, Oct. 31 (TRJ, ADL).

S. The only breeding season record is of several heard, nr. Kenn Moor, June 2 (SMT). Up to five, Sand Bay, Jan.–Mar., Sept.–Dec. (RA, PC); up to four, Chew Valley res., Jan.–Apr., Sept.–Dec. (RA, NTL, MAW *et al.*). Single birds: Locking Pond, Feb. 18, Dec. 16 (PC); Steep Holm, Sept. 16–30, Oct. 22 (S), and nr. Cheddar, Nov. 8 (BR). One dead, Blagdon res., Apr. 15 (PJC).

SPOTTED CRAKE *Porzana porzana*

S. One, Chew Valley res., Sept. 13 (DW), and one, Clevedon, Dec. 21 (RAR). Details supplied.

LITTLE CRAKE *Porzana parva*

S. One, Chew Valley res., May 10, identified by DW at distance of ten feet. Details supplied include: dark grey head, breast and unbarred flanks, dark brown and grey upperparts with paler silver-grey marks, no white or buff beneath tail which was hardly longer than wings. The total impression was of a very dark bird. Record, third for district, accepted by *Brit. Birds* Rarities Committee.

MOORHEN *Gallinula chloropus*

S. Blagdon res.: 32, Feb. 25 (RA) falling to 15, Mar. 25, rising to 28 on 28th with 20, Apr. 9 and 17 on Oct. 29 (PJC).

Coot *Fulica atra*

S. Cheddar res.: 560, Jan. 3, rising to 1,350, Jan. 15 (JAMCG)—cf. 250–380, mid-Jan., 1966—then falling gradually to 75, Mar. 12 with one, Mar. 24 (JAMCG, BR); autumn counts—one, Aug. 6, rising to 1,500–1,550, mid-Oct. with max. of 1,700, Nov. 4–12 and 1,000, Nov. 18, the last count. Blagdon res.: 300, Jan. 21 (RA); 16 occupied nests, May 30 (PC); 800, Sept. 3 and 600, Nov. 11 (RA, PJC). Chew Valley res.: 570, Jan. 21 and *c.* 700, Sept. 2 (RA). Barrow Gurney resrs.: 78, Jan. 11 (BR).

Oystercatcher *Haematopus ostralegus*

G. and **S.** See Fig. 2. Max., 160, Weston Bay, Jan. 14 (RA).

Lapwing *Vanellus vanellus*

G. and **S.** Bred, Almondsbury; Clapton and Nailsea Moors; Blagdon Hill, Bishop Sutton; Cross and Stoke Moor. Pairs at Walton, Weston, Tickenham and Kenn Moors; and Clevedon Coast. Earliest post-breeding flock—160, Kenn Moor, June 12 (WBC, PH). Heavy weather movements after snow, Jan. 5–8 and Dec. 8–17.

Ringed Plover *Charadrius hiaticula*

G. and **S.** 50 reports. Up to 35, coast, Jan.–Mar. and Oct.–Dec.; 85–120, Apr. 26–May 13; autumn passage Aug.–Sept. with peaks of 800, New Grounds, Aug. 18 (LPA) and 278, Sand Bay, Aug. 20 (RA, TB). Single birds, resrs., Apr. 23–May 15 and up to 20, July 12–Oct. 8.

Little Ringed Plover *Charadrius dubius*

S. One, Chew Valley res., May 5 (BR); many reports of two, imms., July 13–Sept. 3, with possibly a third on July 13, then one to Sept. 12, with two ads. also on 6th–8th (JEA, GLB, PJC *et al.*). One, imm., Cheddar res., July 26 (EGH).

Grey Plover *Charadrius squatarola*

G. and **S.** One, WT enclosures, Apr. 10 (LPA). Up to three, coast, Apr. 9–May 14 (RA, WBC, RMC) and Oct. 7–Nov. 12 (RA, TB), but *c.* 10, Frampton Breakwater, Sept. 23, 24 and Oct. 28 (TRC, RMC).

Golden Plover *Charadrius apricarius*

G. New Grounds: 31, Jan. 7 and one to two, Oct.–Nov. (LPA); two, Beverstone, Sept. 5 (D); one, Tormarton, Aug. 20 and three (one in summer plumage) on 26th (NJC); 50–100, Dec. 3 (EJL).

S. Apparently fewer than in 1966. Noted on coast, Jan. to mid-Apr. and mid-Aug. to Dec.; only counts over 40 were from Weston Bay area—up to 300, Jan., Oct. and Dec., with 700, Dec. 16 (RA).

Inland: 126, Marksbury, Feb. 26 (RJL) and *c.* 50, Nov. 19 (RPW); few records, none over 40, from resrs.; 20–60, Hartcliffe School fields and nearby old airport, Bristol, Oct.–Nov.

LESSER GOLDEN PLOVER *Charadrius dominicus*

G. One, New Grounds (Frampton end), Oct. 4 (EEJ, MAO, DIMW). Details included smaller size (*c.* 2/3) than nearby Golden Plover; back and closed wings even pale grey-brown; underwing, incl. axillaries, grey. Record, first for area, accepted by *Brit. Birds* Rarities Committee.

TURNSTONE *Arenaria interpres*

G. and **S.** Chittening: 200, Mar. 18; 50, July 30, rising steadily to *c.* 300, Sept. 30–Oct. 1 then falling to 100, early Nov. and 50, Dec. 31 (NTL). Elsewhere, up to five on coast, all months, with up to 15, May–Sept. (LPA, RA, WBC, RMC). Up to three, Chew Valley res. Aug. 5–Sept. 7 (CRB, PC, EMP *et al.*).

COMMON SNIPE *Capella gallinago*

G. and **S.** Max., 108, Sand Bay, Jan. 29 (RA, DJP) and 80, Axe Est., Dec. 25 (RA). Breeding display, Apr.–June, Walton and Stoke Moors (PJC, WBC, TRJ *et al.*). 47 reports, 22 observers.

JACK SNIPE *Lymnocryptes minimus*

S. Sand Bay: two, Jan. 29 (PC); one, Mar. 28 (RA); one, Oct. 29 (TBS). Up to three, marshy ground, Mendip, Oct.–Dec. (JAMCG). Single birds, Chew Valley res., Jan.–Mar., Sept. 28–late Nov.

WOODCOCK *Scolopax rusticola*

G. and **S.** Nine records (19 in 1966) of up to three, Jan.–Mar., Sept. and Dec., from Littleton-upon-Severn, Leigh Woods, Long Ashton, Sand Point, Weston Woods, Christon and Wells area.

CURLEW *Numenius arquata*

G. and **S.** See Fig. 2. Max., 310, New Grounds, Oct. 2 (LPA).

WHIMBREL *Numenius phaeopus*

G. and **S.** 39 reports (19 observers), Apr. 22–May 29 and July 7–Oct. 22. Max. counts: ten, Sand Bay, Apr. 29 (RA); 18, Kenn Moor, May 10 (SMT, GW); and *c.* 60, Clevedon, May 13 (PJC, GS). One–two, Chew Valley res., Apr. and July–Oct.

BLACK-TAILED GODWIT *Limosa limosa*

G. and **S.** See Fig. 2. Max., 258, Weston Bay, Oct. 1 (RA).

BAR-TAILED GODWIT *Limosa lapponica*

G. and **S.** Noted on coast (25 reports, 10 observers), Jan.–May and July–Dec. Max., 10, Sand Bay, Jan. 22 and 19, New Grounds, May 5 (LPA).

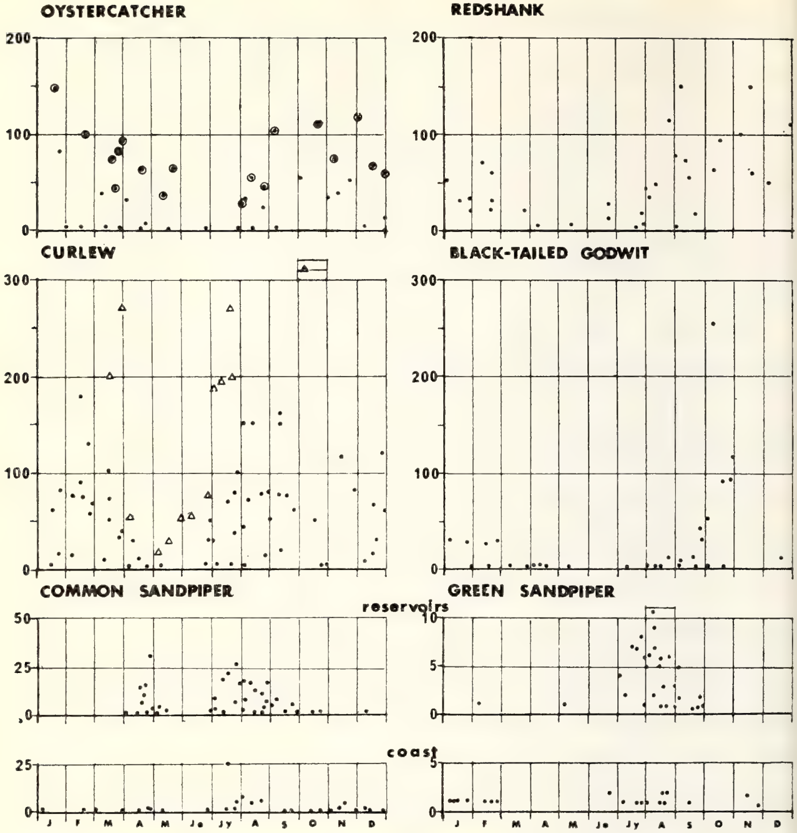

Fig. 2. *Month-by-month counts of certain waders, 1967.*
Graphs of counts reported from Bristol district. Oystercatchers in Weston Bay/Axe Estuary area shown by ringed points; Curlews at New Grounds by triangles. Note sharp peak of Black-tailed Godwit autumn passage; also over-wintering Common Sandpipers, recorded increasingly since 1950—the first local winter record was of one in Dec. 1945.

Green Sandpiper *Tringa ochropus*

G. and **S.** See Fig. 2; 48 reports, 17 observers.

Wood Sandpiper *Tringa glareola*

G. and **S.** Single birds, WT enclosures, June 4 (LPA), New Passage, Aug. 22 (PAR), Blagdon res., Sept. 16 (RMC), Cheddar res., Sept. 22–Oct. 2 (JAMCG, BR, RAR) and New Grounds, Oct. 4 (MAO *et al.*). Up to eight, Chew Valley res., July 28–Sept. 30 (28 reports, 15 observers).

Common Sandpiper *Tringa hypoleuca*

G. and **S.** See Fig. 2; 66 reports, 16 observers.

REDSHANK *Tringa totanus*

G. and **S.** See Fig. 2. Coastal max.: 70, Weston Bay, Feb. 10; 150, Sand Bay, Sept. 4 and Weston Bay, Nov. 18 (RA); up to *c.* 50, New Grounds, Aug. 19–Oct. 4 (LPA). One, R. Avon, Sea Mills, Bristol, Dec. 3 (JFR). One to two, resrs., July, Sept. and Nov. Breeding season records from Portbury Wharf, Clevedon–R. Yeo (nests found), Woodspring and Sand Bays (WBC, ADL, JS, SMT).

SPOTTED REDSHANK *Tringa erythropus*

G. New Grounds: single birds, Apr. 7 and May 5; 21 reports of up to 14, June 24–Dec. 3, but 19, Sept. 16 (LPA).

S. Single birds, Sand Bay and Axe Est., July 23–Sept. 4 (RA). Up to nine, resrs., Aug.–mid-Oct. (28 reports, 17 observers).

LESSER YELLOWLEGS *Tringa flavipes*

S. One of this American species, Chew Valley Lake, Sept. 9, after gales (RJJ, ETW). Record, first for area, accepted by *Brit. Birds* Rarities Committee.

Summary of RJJ's description: bird seemed slightly smaller and neater than Redshank; bill straight, rather slender, a little longer than head; legs bright yellow, long and slender, projecting in flight beyond tail. Entire upper-parts fairly dark grey-brown; back and folded wings well-marked with pale spotting and flecking; head similar grey-brown; prominent white supercilium from bill to behind eye, and pale eye-ring. Folded primaries a little darker than rest of upper-parts. In flight, wings dark and unmarked—no trace of wing-bar. Rump white, squared-off, not extending to back; tail dark, barred and contrasting with rump. Underparts generally dull white, with neck and upper breast lightly streaked greyish. Flight fast, direct. Call a rather thin *cu-cu*, softer and less strident than Greenshank's but audible at a distance.

GREENSHANK *Tringa nebularia*

G. Single birds, New Grounds, May 5, 10 and 14; up to four, coast, July 8–Nov. 20, but five to eight, New Grounds, Aug. 26–Sept. 2 (LPA, GBY, MAO, PAR *et al.*).

S. A return to the low numbers of 1965 and pre-1962. One or two, Sand Bay and Axe Est., 11 dates, July 13–Sept. 17 (RA). Two, Yatton, Sept. 1 (HHD). Resrs.: up to seven, Chew Valley and Cheddar, July 6–Oct. 24 (46 reports, 16 observers); four, Blagdon, Aug. 19 (PJC); one, Chew Valley, Dec. 4 (GBB).

KNOT *Calidris canutus*

G. and **S.** Noted on coast, Jan. 1–May 13, and July 30–Dec. 24 (18 reports); only counts over *c.* 50 were 700, Sand Bay, Jan. 1 and

500, Weston Bay, Jan. 7 (RA), and 500, Blackstone Rocks, Clevedon, Dec. 12 (JFB). Three, Cheddar res., Sept. 16 (JAMCG).

PURPLE SANDPIPER *Calidris maritima*

S. One, Brean Down shore, Dec. 31 (NJC).

LITTLE STINT *Calidris minutus*

G. and **S.** One ringed, New Grounds, Jan. 1. No spring records but exceptional autumn passage brought largest numbers since 1960 from mid-Sept.: nine or more, New Grounds, Sept. 22–Oct. 26 with max. of 32, Sept. 23 (LPA); up to 15, Chew Valley res., and up to 24, Cheddar res.—frequenting island exposed by low water level (JAMCG)—Sept. 16–Oct. 1; other records of up to four, resrs. and coast, Aug. 1–Nov. 21 (35 reports, 25 observers).

BAIRD'S SANDPIPER *Calidris bairdii*

G. One of this American species, near Frampton Breakwater, New Grounds, Oct. 18 (DIMW). Dunlin-coloured, long wings with only faint bar, calling with Curlew Sandpiper-like 'cherret'. Record first for area, accepted by *Brit. Birds* Rarities Committee.

PECTORAL SANDPIPER *Calidris melanotos*

S. One, Barrow Gurney resrs., Sept. 23–28 (AHD, CEH, NTL, JFR *et al.*). Third record for area (others, 1935 and 1964).

DUNLIN *Calidris alpina*

Present all months (48 reports, 26 observers). Max. counts: **G** —600, New Grounds, May 7 and 760, Oct. 9 (LPA, MAO); **S** —3,000–3,500, Sand Bay and Weston Bay, Jan. 29–Feb. 25 (RA, PC, DJP) and 4,500, Sand Bay, Dec. 3 (RA). Up to 14, resrs., Jan.–May and July–Nov.

CURLEW SANDPIPER *Calidris testacea*

G. Single birds, New Grounds, Aug. 5–Oct. 28, with eight, Sept. 23 and three on 30th (LPA, TRC, RMC). Four, Severn Beach Sept. 23 and one, Oct. 1 (JFR, RAR).

S. Up to four, Chew Valley res., Sept. 10–Oct. 2 (GAB, MEB, PD *et al.*).

SANDERLING *Crocethia alba*

G. Noted, New Grounds, May (18 on 27th) and Aug. 13–Oct. 4 with max., 12, latter date (LPA, EAJ, MAO).

S. Sand Bay and Weston Bay: up to five, Feb. 13–May 30—but *c.* 120, Mar. 20 (PC)—and July 30–Dec. 9, with up to 26, Sept. 3–9 (RA, HRHL, TBS). No reservoir records received.

RUFF *Philomachus pugnax*

G. New Grounds: up to eight, Mar. 31, June 24 and July 15–

Sept. 29, also 21, Oct. 1 and one, Nov. 4 (LPA). Two, New Passage, Aug. 22 (PAR) and four, Sept. 13 (RA).

S. Chew Valley res.: up to five, Feb. 12–Mar. 5 and July 6–Oct. 5, with up to 12, Sept. 24–30 (30 reports, 18 observers); three ♂♂, Dec. 30 (RA). Single birds, Sand Bay, Sept. 4 and Weston Bay, Sept. 5 (RA) and Cheddar res., Sept. 9–28 (RMC, JAMCG).

GREY PHALAROPE *Phalaropus fulicarius*

S. One, Chew Valley res., Oct. 29—details supplied (RMC *et al.*).

WILSON'S PHALAROPE *Phalaropus tricolor*

S. One, Chew Valley res., Sept. 8–25 (many observers), was one of nine or so of this Nearctic species recorded in British Isles after early September Atlantic gales—cf. *Brit. Birds*, *60*, p. 516, 1967. (Another was present at Durleigh res., nr. Bridgwater, same time). Record, first for area, accepted by *Brit. Birds* Rarities Committee.

Digest of descriptions: a small, long-legged, longish-necked wader, with relatively small round head and long straight bill. Size: '*c.* size of Wood Sandpiper,' 'perhaps 50% bigger than Dunlin,' 'dwarfed by Spotted Redshank but nearly twice size of Little Stint.' Upper-parts dark grey, with brownish tinge in some lights. Tail pale grey, not contrasting with white, squared-off rump. Wings long—almost to tip of tail—and narrow, looking darker in flight than at rest. Bill dark, needle-like, perhaps twice length of head; crown dark grey; face white with dark mark through black eye. Neck white in front, greyish at sides, dark grey at back and nape. Under-parts clear white; legs dull yellow, long, extending in flight beyond tail.

Associated much with Little Stints and Ringed Plovers. Flight rapid with powerful wingbeats. Fed on mud or in shallows, not swimming but constantly in motion, sometimes spinning round and round (as do other Phalaropes when feeding while swimming); never probed, but picked food delicately from surface, moving head from side to side, with legs flexed and body held horizontal or tail-up. Once seen to jump in air with neck outstretched to take insect.

RJJ and ETW, who saw both birds within a short time, noted that, compared with the Lesser Yellowlegs (q.v.), the Wilson's Phalarope looked smaller; was differently shaped, with small head and heavy body compared with neat shape of former; was greyer and more uniform on upper-parts, lacking spotting, and paler and whiter about head; had gleaming white underparts with no grey streaking; had far less bright yellow legs, and an odd galloping gait; had an even thinner bill; and its tail was much paler and unbarred when seen in flight.

ARCTIC SKUA *Stercorarius parasiticus*

G. Imm. over river, New Grounds, Sept. 8, 9, 15 and one, Nov. 6 (LPA, GBY). One, New Passage, Oct. 29 (HWN, JFR).

S. One seen in flight and at rest, Sand Bay, Sept. 7 (RA).

GREAT SKUA *Stercorarius skua*

S. One circled Sand Bay, then rested on mud, Sept. 4 (TB).

LONG-TAILED SKUA *Stercorarius longicaudus*

G. One just north of New Grounds on unusual date of May 27—seen in flight and later at rest from as close as 10 ft. by LPA, JDS and DIMW whose notes mention: small; slighter build than Arctic Skuas, with extremely thin, long central tail streamers, projecting about 8 in. beyond outer tail feathers and 4 in. or more beyond closed wings; intense black cap separated from greyish brown mantle by white collar; white underparts becoming light sooty-grey towards, and brown on, ventral region and tail. No obvious wing patch but at close quarters white shafts of blackish-brown primaries formed small pale patch on upper surface but not on blackish-brown underwing. Fourth record for area.

GREAT BLACK-BACKED GULL *Larus marinus*

S. Steep Holm breeding colony reduced to 40–41 pairs (cf. 74 nests, 1963 and 95, 1962); pullus ringed (419098) there, 28.6.64, found dead, 11.6.67, Burton-on-Trent, 120 m. N.E. (s).

LESSER BLACK-BACKED GULL *Larus fuscus graellsii*

S. Continue to roost at Chew Valley res., numbers at times very large—at least 1,300, Mar. 14; all those examined in good light were of this race (PJC).

SCANDINAVIAN LESSER BLACK-BACKED GULL *Larus fuscus fuscus*

S. One standing with four *L. f. graellsii* watched in good light for several minutes, Chew Valley res., Feb. 20 (APR).

ICELAND GULL *Larus glaucoides*

G. and **S.** Two, possibly three, birds reported. First-year bird, Blagdon res., Feb. 26 (AHD *et al.*). Possibly same bird at roost, Chew Valley res., Mar. 14 (PJC) and another, in active wing moult, R. Avon, Bedminster, Bristol, Mar. 15, 16, 23 (PJC). Immature with Herring Gulls, Chew Valley res., Mar. 30 (TRJ, ADL, SJM).

COMMON GULL *Larus canus*

S. Only one roost count received—500, Chew Valley res., Mar. 25 (PJC). Regular in small numbers at other resrs. during daytime (BR *et al.*) and movement from Axe Estuary roost noted in Winscombe-Sidcot area where birds present daily, mid-Oct. to end of year (HHD, WLR *et al.*).

LITTLE GULL *Larus minutus*

G. Imm. over river, New Grounds, Sept. 8 (LPA, GBY).

S. Two imms., Chew Valley res., Mar. 4–20 (BR, RJS *et al.*). Autumn reservoir records: two, Chew Valley, Aug. 8 and three on 23rd, thereafter one to Sept. 22 when three again seen, then two present to Nov. 2 and one to 11th; single birds occasionally moving to Blagdon during day, Aug. 28–Oct. 8; one Cheddar, Sept. 21, 22 (GLB, TRC, RH, TBS *et al.*).

Kittiwake *Rissa tridactyla*

G. Second-year bird, Duchess' Pond, Stapleton, Bristol, Feb. 4 (CG). Imm. over river, New Grounds, Sept. 5 (LPA).

S. Remains of long-dead imm., Weston Bay, Jan. 25 (PC). Two ads., Cheddar res., Mar. 1, one of which died, other remained till Apr. 28 (SEC, EGH *et al.*) and single birds, Oct. 29 (RMC), Nov. 4 (BR). Two ads., Sand Bay, Sept. 4 (TB) and one flying N.E., Dec. 26, possibly the one seen, Weston Bay on 25th (PC).

Black Tern *Chlidonias niger*

G. Single birds on Estuary, New Grounds, Aug. 16, Sept. 2 (LPA) and New Passage, Sept. 21, 22 (RA, CAP).

S. Spring records: Chew Valley res.—two, May 5; 16, May 10; 22 on 11th and one on 13th (RSH, BR, DW). Large movement through area, early Aug., with *c.* 120 seen on 8th. Otherwise, largest numbers were 15–30, Chew Valley res.; ten, Cheddar and seven, Blagdon (JEA, PD, JAMCG, EMP *et al.*). One, Barrow Gurney resrs., Oct. 1 and 2 (HWN, CEDS *et al.*). Last record—seven, Chew Valley, Oct. 17 (GLB).

White-winged Black Tern *Chlidonias leucopterus*

S. Single ad. with Black Terns, Chew Valley res., Sept. 10 (RMC, AHD *et al.*). Record, fourth for area, accepted by *Brit. Birds* Rarities Committee—cf. *Proc. B.N.S.*, 1966, p. 266.

Gull-billed Tern *Gelochelidon nilotica*

G. One seen by DIMW, Frampton Sands, Oct. 1—large size, general white appearance, greyer upper-parts than Sandwich Tern and stout black bill. Record, first for area, accepted by *Brit. Birds* Rarities Committee.

Common Tern *Sterna hirundo* Arctic Tern *Sterna macrura*

G. Two over Filton, Bristol, May 1 (PAR). New Grounds: three, May 5, 27, and two, June 23 (LPA); one or two, various dates, July 8–Oct. 2, with eight, Sept. 5 (LPA, GBY).

S. Spring resr. records: three, Chew Valley, May 5; one, Cheddar, May 7; one, Barrow Gurney, May 21. Prolonged return passage (July 2–Nov. 9) with influx into area, early Sept.:

September	3/4	5	6	7	8	9	10
Blagdon res.						16	
Cheddar res.	1			50	1	40	15
Chew Valley res.	5	150	100	65	20		2
Weston Bay	1				1		
Sand Bay	6						1

Thirty-four later records, mostly of fewer than ten birds, but 16, Chew Valley, Oct. 5 and 14 on 7th (19 observers).

Roseate Tern *Sterna dougallii*

S. Adult, Chew Valley res., Sept. 5, seen from as close as four yards. Features noted included very white appearance, much longer tail-streamers than other terns present, long black bill with hint of red at base, very buoyant flight (RAR, GPT, KEV). See p. 362.

Little Tern *Sterna albifrons*

G. Three over Estuary, New Grounds, May 13 and two, Aug. 29; one over canal, Patch Bridge, Slimbridge, July 15 (LPA, GBY).

S. Two, Sand Bay, Sept. 3, 7 and one, Axe Estuary, on 8th (RA). Reservoirs: one, Blagdon, Sept. 30, Oct. 14; three, Chew Valley, Sept. 30; and five, Cheddar, Oct. 3 (RA).

Sandwich Tern *Sterna sandviciensis*

S. One, Chew Valley res., Aug. 26 (RMC).

Razorbill *Alca torda*

S. Dead ad. on tide wrack, Weston Bay, May 21 (RA). Three off Steep Holm, June 11 and one, July 2 (S). One flying up-channel, Clevedon, Sept. 23 (WBC).

Guillemot *Uria aalge*

S. Four in channel off Weston-s-Mare, May 14 (SJM, EAW). One off Steep Holm, July 4 (S) and one off Brean Down, Sept. 27 (EGH).

Puffin *Fratercula arctica*

S. First-winter bird, Cheddar res., Nov. 4, 5, caught on 6th in nearby strawberry beds and released, Brean, on 7th (TL, BR *et al.*).

Stock Dove *Columba oenas*

G. and **S.** Breeding season reports from localities additional to those in 1966: Uphill, Worle, Woodspring Bay and Ashton Park. Nest in barn, Rodney Stoke, at 1964–5 site (TRJ, ADL, SJM). Flock of 10, Tynings Farm, Shipham, Apr. 30 (TBS).

Turtle Dove *Streptopelia turtur*

G. Single birds: Tortworth Lake, Apr. 30; Inglestone Common, May 26; Severn Beach, June 18 and New Passage, Aug. 2 (RA, JH, TRJ, ADL, SJM).

S. Reports of single birds and at least 18 pairs from Steep Holm, Uphill, Weston Woods, Sand Point, Lox Yeo Valley, Mendip—four localities, Blagdon res., Chew Valley area, Kilmersdon, Brockley and Goblin Combes, Gordano Valley and Nailsea, Apr.—Sept. (JEA, PJC, AMS *et al.*).

COLLARED DOVE *Streptopelia decaocto*

G. Some signs of WT population levelling out at *c.* 250 birds, partly due to predation by ♀ Sparrowhawk taking two or three doves a week. Pairs in most nearby villages (MAO); also reported from Didmarton, Dursley and Tetbury (D, HHD) and breeding records, Bristol, from St. Michael's Hill, Clifton (6 pairs), Westbury-on-Trym and Shirehampton—where flock of 100 seen in March (AEB, CG *et al.*). Avonmouth seems to attract fewer birds than hitherto—max. 80, cf. at least 150, early Feb., 1966 (PJC, CL).

S. Breeding season reports from Pill, Leigh Woods, Failand, Long Ashton and nearby Cambridge Batch, Portishead, Weston- and Walton-in-Gordano, Nailsea, Clevedon, Weston-s-Mare and Newton St. Loe (GAB, JFB, WBC, HHD *et al.*). Two seen with diurnal migrants, Steep Holm, Sept. 21 (S).

CUCKOO *Cuculus canorus*

G. and **S.** First noted, Rowberrow, Apr. 9 (RMC). Juvs. seen, Yate Rocks (APR), Brean Down and Bishop Sutton. Six together, feeding on caterpillars, Velvet Bottom, Mendip, May 21 (ADL).

BARN OWL *Tyto alba*

G. Pair seen regularly, New Grounds, probably bred (MAO).

S. Single birds, Cheddar res., Shipham, Chew Valley res. and nr. Compton Dando, Jan.–Oct. (TBS, DW, RPW *et al.*).

LITTLE OWL *Athene noctua*

G. and **S.** Reports (82) from 44 localities—10 in **G.**—all months. Breeding season records from 39 localities, breeding confirmed in three, and total of 18 pairs reported.

TAWNY OWL *Strix aluco*

G. and **S.** Reports (146) from 79 localities—26 in **G.**—all months. Breeding recorded in 10 localities. Birds found dead, Avonmouth, St. Anne's (Bristol), Pensford and Shockerwick nr. Bath.

SHORT-EARED OWL *Asio flammeus*

S. Single birds, Chew Valley res., Nov. 12 (RH) and Clevedon, Dec. 21 (RAR).

NIGHTJAR *Caprimulgus europaeus*

S. One, Ashton Hill Plantation, June 7 (JEA, GEC).

SWIFT *Apus apus*

S. Usual large numbers 'hawking' over resrs., May–July; exceptional number (at least 5,000), Chew Valley, June 3 (RSH). Extreme dates—single birds, Chew Valley, Apr. 11, Sept. 25 (NTL, NJC); noted over Bristol, April 28 (TRJ).

ALPINE SWIFT *Apus melba*

S. One off Steep Holm, Sept. 30 (DL, JM, JO, PST). Record, accepted by *Brit. Birds* Rarities Committee, is third for area.

KINGFISHER *Alcedo atthis*

G. and **S.** Nearly 70 records (28 observers), all months, from many localities, confirm marked recovery from losses of 1962–3 (cf. *Proc. B.N.S.*, 1966, p. 268); most refer to single birds, but up to four seen, Chew Valley res., several dates.

GREEN WOODPECKER *Picus viridis*

G. and **S.** Breeding season records from Tortworth, Lasborough Park nr. Kingscote, Rudgeway, New Passage, Long Ashton, Brockley Combe, Cleeve, Blagdon, Clapton-in-Gordano, Yarborough (Christon), Weston Woods and Uphill (20+ observers).

GREAT SPOTTED WOODPECKER *Dendrocopus major*

G. and **S.** Reported nearly all months—24 reports (12 in period Apr.–June)—cf. 67 (41) in 1966. Breeding season records from Waterley Bottom (Dursley), Newton St. Loe, Long Ashton, Leigh Woods, Clapton– and Walton-in-Gordano, Brockley Combe, Blagdon, Ubley and Rickford Combe (10+ observers).

LESSER SPOTTED WOODPECKER *Dendrocopus minor*

G. Single birds: Rudgeway, May 11 and Blaise Woods, Bristol, on 25th (APR); Tockington, Sept. 5, 14 (AEB), and Wick, Dec. 26 (DRH).

S. Single birds, Chew Valley, Jan. 5 (GWB), Apr. 1, Dec. 18 (DW) and Oct. 30 (EGH); Long Ashton, Feb. 25 and Failand, Mar. 6 (NTL); Ubley, Mar. 12 (PJC); Blagdon, Mar. 23 (TRC, PLG), May 3 (AEB), June 19 (HWN); Clapton-in-Gordano, Apr. 22 (JEA); Widcombe (Bath), Apr. 27 (RMC); Frome, Sept. 9, and Backwell, Dec. 10 (GEC).

WRYNECK *Jynx torquilla*

S. One on garden wall, Ham Lane, Wraxall, Apr. 27 (HLH) One among low bushes, Sand Point, Oct. 1 (PC)—a late date. One at Brean Down, Sept. 19, 1966, was first seen taking ants from the road, then moved to a small elder tree (RA).

WOODLARK *Lullula arborea*

S. One, Chew Valley res., Mar. 10 (TG); three, Sand Point, Aug. 2 (TB); four, Yatton, Oct. 29 (HHD).

SAND MARTIN *Riparia riparia*

S. First migrants, Sand Bay, Mar. 16 (TB). Max. of *c.* 350, Blagdon res., Mar. 30 (PJC). Bred in wall drains, Keynsham (KT) and Parson St. Station, Bristol (BR).

RAVEN *Corvus corax*

S. One or two, Brean Down area, all months except June, with four, Aug. 13 (RA, PC *et al.*). Two, Cadbury Camp, Apr. 13 (HHD), Ashton Hill Plantation, Apr. 20 (HRHL), Cheddar res., Apr. 22 (TBS), Burrington Combe, July 25 (PC) and Steep Holm, Sept. 28 (S). One, Shipham, Nov. 4 (TBS).

ROOK *Corvus frugilegus*

G. Sample of 40 Rookeries in Severn Vale contained 848 nests apparently occupied, Apr. 15–29; of these, 513 were in Rookeries also censused in recent years and analysis suggests from 6–18% increase over 1966, following decreases since 1961 (JH, MAO, CO, SMT).

WILLOW TIT *Parus montanus*

S. Two, Walton Moor, Apr. 16 (GS). Details supplied.

WREN *Troglodytes troglodytes*

G. and **S.** Continued increase—see p. 363. Some 20 pairs, Steep Holm, where also numerous in autumn (S).

DIPPER *Cinclus cinclus*

G. Pairs reported, Little Avon nr. Kingswood, Aug. 28 (D) and R. Boyd, Wick, throughout year (DRH).

S. Single birds, Midford—Combe Hay, dates in April (RMC).

RING OUZEL *Turdus torquatus*

G. and **S.** Up to three, Filton, Clapton-in-Gordano, Nailsea Moor (unusual locality), Sand Point, Brean Down, Mar. 15–30 (RGH, HRH *et al.*); six ♂♂, Crook Peak, Apr. 9 (AMR); two ♂♂, Blackdown, May 5 (TBS). Single birds, Sand Point, Sept. 6 (TB) and Steep Holm, Sept. 21 (S).

WHEATEAR *Oenanthe oenanthe*

G. One or two, New Grounds, Purton, Lasborough Park nr. Kingscote, Filton, Mar. 25–May 8. Up to five, New Grounds, New Passage, Filton, West Littleton, July 7–Oct. 2 (LPA, D *et al.*).

S. Twelve, Sand Bay, Apr. 9 (RA). Up to four (32 reports, mainly from coast and resrs.), Mar. 4–May 29 and July 25–Nov. 11.

STONECHAT *Saxicola torquata*

G. and **S.** Sixteen records, Jan. 4–Apr. 1 and twenty-two, Sept. 27–Dec. 29 (16 observers). Breeding season reports from Sand Point, where at least one pair bred, Brean Down, Cross and Blackdown, Mendip (RA, PC, WLR *et al.*).

WHINCHAT *Saxicola rubetra*

G. Up to three, New Grounds, Wotton-u-Edge and Filton, July 21–Sept. 21 (RA, D, MAO).

S. Bred, Tickenham Moor, Blackdown and Chew Valley res. (PG, TBS, DW). Up to five, Cadbury Camp and coastal localities, Apr. 30–Oct. 3 (13 observers).

REDSTART *Phoenicurus phoenicurus*

G. and **S.** Bred, Brockley Combe and Rodney Stoke (ADL, EAW, GW). Other breeding season reports, Leigh Woods, Goblin Combe, Uphill, North Stoke and Charmy Down. Records, July–Sept., from Filton, Backwell, Nailsea, Steep Holm, Sand Point, Compton Bishop, Newton St. Loe and Odd Down, Bath (17 observers).

BLACK REDSTART *Phoenicurus ochruros*

G. and **S.** Single birds, Brean Down, Oct. 22 (RA), Cheddar res., Nov. 8 (BR), Churchill, Nov. 20 (TBS) and Cotham (Bristol), Nov. 21 (KJH). Two, Blagdon res., Nov. 18 (RJP).

NIGHTINGALE *Luscinia megarhynchos*

Reports of singing ♂♂ from: **G.**—Littleton-on-Severn; Inglestone Common; Oakford; Avon Gorge; and **S.**—Ashton Hill Plantation, Sand Point, Sandford, Shute Shelve, Cheddar Wood, Draycott and Combe Hay nr. Bath (JEA, RMC, HRHL *et al.*).

REED WARBLER *Acrocephalus scirpaceus*

G. and **S.** Breeding season reports from Littleton-on-Severn, Bleadon and Chew Valley res. (RA, AEB).

MELODIOUS WARBLER *Hippolais polyglotta*

S. One trapped, Steep Holm, Aug. 28 (S). Details included: upper-parts greyish-brown with greenish tint; wings brown with greenish-white fringe on secondaries forming faint wing panel. Heavy, long, dark brown bill—lower mandible yellowish-orange beneath with pink tinge at base. Yellowish superciliary stripe and underparts. Tail brownish-grey with pale fringe on outer feathers. Legs bluish. Three rictal bristles. Wing length 63½ mm. with 3rd primary longest, 4th ½ mm. shorter and 2nd 5 mm. shorter. Second record for area, cf. *Proc. B.N.S.*, 1961, p.265.

CHIFFCHAFF *Phylloscopus collybita*

S. Winter records, probably this species, Jan.–Feb. (five localities, 6 observers) and Brean Down, Dec. 11 (F).

WOOD WARBLER *Phylloscopus sibilatrix*

G. and **S.** Up to three, Stapleton (Bristol), Leigh Woods, Ashton Park, Cadbury Camp, Brockley Combe, Goblin Combe, Clevedon, Weston Woods, Dolebury Warren, Rickford Combe, W. Horrington nr. Wells, and Bath (WBC, PJC, HHD *et al.*).

PIED FLYCATCHER *Muscicapa hypoleuca*

G. and **S.** Female, Uphill, May 5; ♂ in full song, Leigh Woods, May 15; ♀ or imm., Filton, Aug. 18 and Brean Down, Aug. 13, 18 (RA).

TREE PIPIT *Anthus trivialis*

G. and **S.** Breeding season records from Leigh Woods, Wrington Warren (8 prs.—PJC), Burrington Combe, Mendip Forest, Rowberrow Warren, Ubley Hill (ADL, JAMCG *et al.*). Up to six, Filton, Steep Holm, Sand Point, Middle Hope, Shipham. Aug.–Sept. (RA, TBS).

ROCK PIPIT *Anthus spinoletta petrosus*

S. Cheddar res.: single birds, Mar. 4 and Nov. 18 (RMC); two, Nov. 17 (BR).

WATER PIPIT *Anthus spinoletta spinoletta*

S. Up to four, Cheddar and Chew Valley resrs., Jan.–Apr. and single birds, Nov.–Dec. (TRC, JAMCG *et al.*).

WHITE WAGTAIL *Motacilla alba alba*

S. One, Blagdon res., Mar. 7 (ACL). One, Sand Bay, Apr. 9, and two on 30th (RA).

GREAT GREY SHRIKE *Lanius excubitor*

S. One near Emborough, Nov. 10, 1966 (RSH).

HAWFINCH *Coccothraustes coccothraustes*

G. Four, Frampton-on-Severn, Jan. 14, and two, Dec. 28 (GWB, TRC). One, Clifton, Bristol, May 15 (RA).

SISKIN *Carduelis spinus*

S. Reports (25) of up to 15: Brockley Combe, N. Widcombe and resrs., Jan.–Apr.; Sand Point and Shipham, Oct.–Nov.

TWITE *Carduelis flavirostris*

G. One, New Grounds, Oct. 30 (LPA).

S. Parties of nine and five, Sand Bay to Weston-s-Mare, Feb. 12, 23 (TB, PC, DJP)—details supplied.

REDPOLL *Carduelis flammea*

G. and **S.** Single birds, Dolebury Warren, Jan. 21, Ashton Hill Plantation, Apr. 20, and Weston Woods, May 1–17 (but two there, Apr. 8); two, Filton, Oct. 24, and up to six, Leigh Woods, Dec. 9, 10. Also 24 reports, Jan.–Apr. and Sept.–Dec., from coast and reservoirs.

CROSSBILL *Loxia curvirostra*

G. Fourteen, Durdham Down, Bristol, July 11 (TBS).

S. Parties of up to 15, Ashton Hill Plantation, Wraxall and Blagdon res., Feb.–Mar. Single birds, Stock Hill, Mendip, Aug. 20 and Barrow Gurney resrs., Nov. 11 (RGH, NTL, DW).

BRAMBLING *Fringilla montifringilla*

G. and **S.** Reports of up to six from 15 localities, Jan.–Apr. 12 and Oct. 19–Dec. (14 observers) but up to 200, Severn Beach (GS) and up to 100, Sand Point area (PC, DJP), late Jan.

CORN BUNTING *Emberiza calandra*

G. Singing ♂♂: at least two, Kingscote, Apr. 23 (D); count of 36, Marshfield–Tormarton road, May 5 (NJC); single bird, New Grounds, June 10 (LPA).

S. Up to four, Lansdown Rd., Bath, and Charmy Down, May 10, and Bath Racecourse, Lansdown, June 15 (RMC, DRH).

CIRL BUNTING *Emberiza circlus*

S. Single birds, Portishead, Clevedon, Sand Point, Worlebury, Goblin Combe, Cross and Cheddar, Jan., and Apr.–Sept.

LAPLAND BUNTING *Calcarius lapponicus*

G. One, New Grounds, Nov. 20 (LPA).

SNOW BUNTING *Plectrophenax nivalis*

G. and **S.** Up to two, New Grounds, Nov. (LPA) and up to five, Sand Bay and Brean Down, Jan. and Oct.–Dec. (TB, PJC *et al.*).

TREE SPARROW *Passer montanus*

G. and **S.** 150, Severn Beach, Jan. 22 (GS). Reports of up to 40, all months, from 20 localities (17 observers).

OTHER COMMON OR REGULARLY OCCURRING SPECIES PRESENT (those marked * are mentioned in the Foreword).

Residents: Heron*, Pheasant, Herring Gull, Black-headed Gull, Woodpigeon, Skylark*, Swallow*, House Martin*, Carrion Crow, Jackdaw, Magpie, Jay, Great Tit, Blue Tit, Coal Tit, Marsh Tit, Long-tailed Tit*, Nuthatch, Treecreeper, Mistle Thrush, Song Thrush*, Blackbird*, Robin*, Goldcrest, Dunnock*, Meadow Pipit, Pied Wagtail, Grey Wagtail, Starling*, Greenfinch, Goldfinch, Linnet, Bullfinch, Chaffinch*, Yellowhammer, Reed Bunting, House Sparrow.

Summer or winter visitors and passage migrants: Fieldfare, Redwing*, Sedge Warbler, Blackcap*, Garden Warbler, Whitethroat, Lesser Whitethroat*, Willow Warbler, Spotted Flycatcher, Yellow Wagtail.

STUDIES ON THE BIRDS OF PREY OF THE BRISTOL DISTRICT

III. BREEDING SEASON OF THE KESTREL

By D. Warden

VERY little has been published on specific aspects of the biology of many relatively common species of British birds.

The fullest published statement about the breeding season of the Kestrel *Falco tinnunculus* appears to be that in Witherby *et al.* (1952) which gives the start of the breeding season as from mid-April in the south (sometimes a little earlier) to mid-May in the north. Fisher (1951) implies that eggs may be found in the nest from the end of March until mid-June and young from the end of April until mid-July. Neither reference indicates the relative frequencies at particular periods within the stated ranges.

This paper summarises information on the timing of the breeding season in the Bristol district. It is based on records collected during the Ornithological Section's study of the local birds of prey. Some supplementary information relating to neighbouring areas has also been used. Owing to the paucity of the available data, the results should be taken as no more than an indication of the probable extent of the breeding season, but in the absence of other information it seemed worth while to place them on record.

DATA AND METHOD

The data consist of observations at twenty-five Kestrel nests found in the Bristol area, mainly during the years 1964–67. Information from eleven nests elsewhere in Gloucestershire and Somerset in 1951–65 has also been incorporated. This was extracted, by permission, from Nest Record Cards deposited at the British Trust for Ornithology.

The commencement of incubation has been used as the starting point of the breeding season, since this eliminates complications due to loss of eggs or young from the nest and enables more records to be used. Few records give the commencement of incubation directly but many enable it to be calculated. The method used is basically that of Summers-Smith (1952). If the hatching date is known, or that of fledging, then from the incubation and fledging times given by Witherby *et al.* (1952), simple subtraction of 28 or 58 days respectively gives the commencement of incubation. For nests with young where the fledging date is not accurately known, the observer's descriptions of the young have been used to calculate date of hatching. Nests found with eggs and not subsequently visited were assumed to be half incubated. The data so obtained were grouped into ten-day periods and expressed as percentages of the total. They are plotted in Fig. 1B. It is realised that the incubation period may differ by a day either way from the assumed 28 days, and the nestling period by up to two days either way from the assumed 30 days. No allowance has been made for these possibilities but in view of the final grouping into ten-day periods, they would have little effect on the overall picture.

Local data have also been compared with those of Fisher (1951) for the range of dates when eggs and young are likely to be in the nest. Local observations of display and of post-fledging family parties have been incorporated for completeness (Fig. 1A).

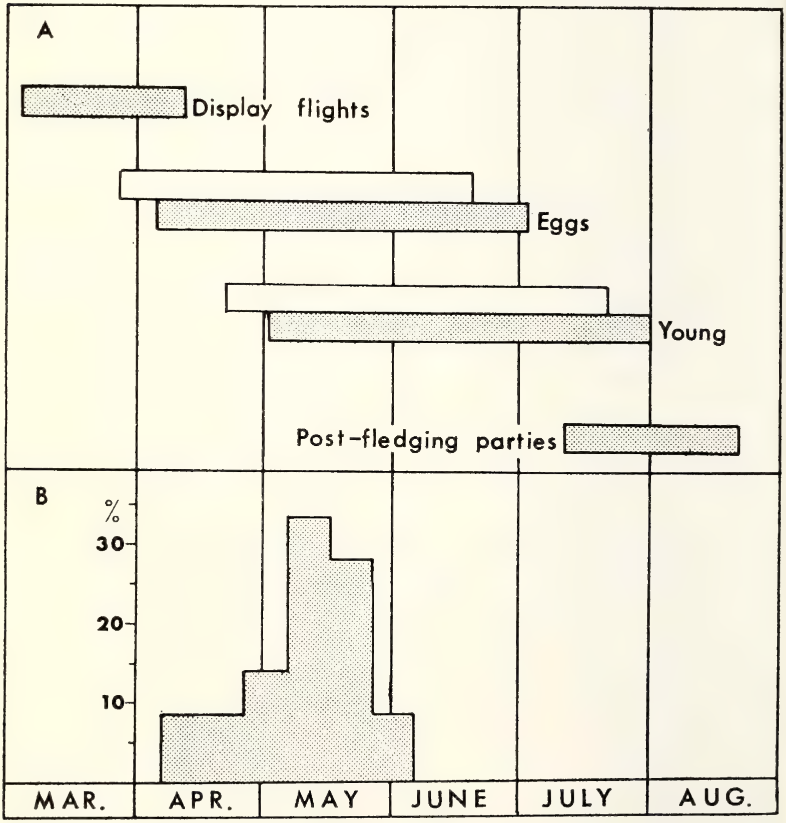

Fig. 1(A). *Time ranges of main events in Kestrel breeding season, from local studies (shaded), and from Fisher, 1951 (unshaded).*
(B) *Frequency distribution of dates of start of incubation grouped into ten-day periods.*

CONCLUSIONS

The small sample of nest records available gives a wide scatter of sixty days during which incubation commenced, but 25 out of 36, or 70%, fell in the second half of the period—that is, from May 7 to June 5—and 22, or 61%, fell within the period May 7–26. The data are too few to permit any attempt to relate the start of incubation to the weather pattern over the period in question. It can, however, be asserted with some confidence that the asymmetrical peak of Fig. 1 is not merely the result of chance variations from a symmetrical pattern. A chi-squared test gives 0.1% as the probability that a sample as extreme as ours would arise from a uniform distribution. For a symmetrical peaked distribution, the observed sample would have a larger, but still small, probability of occurring by chance: for example, for a Gaussian distribution with mean and standard distribution equal to those of the sample, the probability is 2½%.

ACKNOWLEDGMENTS

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LEPIDOPTERA NOTES BRISTOL DISTRICT, 1967

BUTTERFLIES

By A. D. R. Brown

On the whole, 1967 was not a good year for the lepidopterist, and very few records of migrant species were received. No records were made of the Pearl-bordered or the High Brown Fritillary. However, some interesting aberrations were taken at various times, including a gynandrous female Orange Tip (*Anthocharis cardamines* L.).

Contributors were: R. Angles (R.A.), A. D. R. Brown (A.D.R.B.), J. F. Burton (J.F.B.), H. H. Davis (H.H.D.), D. J. Foxwell(D.J.F.), D. G. Gibb (D.G.G.), Miss I. F. Gravestock (I.F.G.), D. R. Hamblett (D.R.H.), A. Kennard (A.K.), K. H. Poole (K.H.P.), T. & M. Silcocks (T. & M.S.), C. W. Wiltshire (C.W.W.) and Miss D. Withers (D.W.).

The records are listed in two categories: those from Bristol and Gloucestershire (**G.**), and Somerset (**S.**).

Pararge aegeria L. (Speckled Wood)

1967 was another good year for this species, the earliest records being: one specimen from Coombe Dingle, Bristol, on Apr. 14 (A.D.R.B.); 2 from Sand Point, **S.**, on Apr. 16 (R.A.); one from Pill, **S.**, on Apr. 23 (J.F.B.). The last specimen seen was one from Weston Wood, **S.**, on Oct. 1 (R. A.). A number of larvae and one pupa were found on clumps of grass around lime trees in Stoke Bishop, Bristol, on Jan. 9 (A.D.R.B., C.W.W.). The spring brood was quite variable and some interesting aberrations were taken at Coombe Dingle, Bristol, in April (A.D.R.B.).

Pararge megera L. (Wall Brown)

This species was particularly scarce during 1967 and no records were received from Gloucestershire or Bristol.

S. Brean Down: 4, Sept. 3 (R.A.); Draycott: 3, May 15 (T. & M.S.), 5, Aug. 30 (T. & M.S.);Ashcott: 1, Aug. 18 and 3 or 4, Aug. 21 (J.F.B.); Walton Hill: 2, May 29 (A.D.R.B.); Saltford: Aug. 9 and 20 (A.K.); Shipham: single specimens on Aug. 9, Sept. 1 and 8 (T. & M.S.); Sand Point: 8, Aug. 13 (R.A.); Cheddar: 3, Aug. 5 (T. & M.S.); Huntspill: 2, Aug. 5 (R.A.); Wick St. Lawrence: 1 or 2, Aug. 23 (T. & M.S.).

Melanargia galathea L. (Marbled White)

This species was more abundant than in previous years, the first specimen being seen on June 18. The majority of those observed on Kingsweston Down, Bristol, had a ground colour of pale primrose yellow, and a single specimen with the black markings replaced by pinkish-buff was taken in the same locality during 1966 (C.W.W.).

G. Inglestone Common: abundant, July 9 and 16 (A.D.R.B.), Aug. 5 (A.K.); Damery: several, July 9 (A.D.R.B.); Stinchcombe: abundant, July 16 (A.D.R.B.); Kingsweston Down: single specimens, June 18, 28 and 29, abundant, July 7, 13 and 17 (A.D.R.B.).

S. Goblin Combe: 2, July 2 (A.D.R.B.), large fresh colony, July 13 (D.J.F.); Brean Down: 1, July 5 (R.A.); Cadbury Camp: 1, July 21 (H.H.D.); Blagdon: 6, July 15 (R.A.); Windmill Hill: at least 2, July 22 (T. & M.S.); Sand Point: 1, July 23 (R.A.); Sandford Hill: plentiful, July 13 (T. & M.S.).

Eumenis semele L. (Grayling)

This is still a local and rather scarce species in the Bristol district.

S. Sand Point: 5, July 30 (T. & M.S.); 6, Aug. 6 (R.A.); Brean Down: 2, July 5; 3, July 30; 1, Aug. 13 (R.A.); Dolebury Warren: Aug. 20 (A.K.).

Maniola tithonus L. (Hedge Brown)

Observed in a large number of places, but never very common.

G. Inglestone Common: a few, July 16 (A.D.R.B.); several, Aug. 5 (A.K.); Michael Wood: plentiful, Aug. 6 (D.G.G.); Kingsweston Down: abundant, July 17 (A.D.R.B.); Wick: 2 or 3 in July (D.R.H.).

S. Clevedon: several, July 7 (A.D.R.B.), one fresh male, July 16, numerous, July 22 and 23, and a few worn specimens on July 28 (J.F.B.); Sand Point: 20, July 30 (T. & M.S.), 12, July 30 (R.A.); Sand Bay: July 23 (R.A.); Brean Down: 4, July 30 (R.A.); Brockley Combe: July 13 (D.J.F.); West Park: observed during July (H.H.D.); Cheddar: 1, Aug. 5 (T. & M.S.); Saltford: July 30 (A.K.); Huntspill: 1, Aug. 5 (R.A.); Shipham: 2, July 28; 2, Aug. 5; 1, Aug. 6 (T. & M.S.); Chew Valley Lake: 2, July 23 (T. & M.S.); Blagdon: 5, Aug. 13 (T. & M.S.).

Maniola jurtina L. (Meadow Brown)

This species was again very plentiful during 1967; the first records were: one from Kingsweston Down, Bristol, on June 16 (A.D.R.B.), one from Brean Down, **S.**, on June 14 (R.A.), and several from Brockley Combe, **S.**, on June 17 (D.J.F.).

Coenonympha pamphilus L. (Small Heath)

Large numbers of this species were seen in the Bristol district in 1967, and in certain places, such as Kingsweston Down, Bristol, one could count hundreds over a period of about five minutes (A.D.R.B.). Several good aberrations were taken near Broadway, **S.**, on May 28 (A.D.R.B.).

G. Filton: 3, June 1 (R.A.), abundant, June 10 (A.D.R.B.), abundant, July 11 (A.D.R.B.), 1, Sept. 14 (R.A.); Inglestone Common: abundant, July 9 and 16 (A.D.R.B.); Michael Wood: abundant, June 18 and July 9 (A.D.R.B.); Pilning: abundant, July 2 (A.D.R.B.); Stinchcombe: abundant, July 16 (A.D.R.B.); Willsbridge: a few, June 25 (A.D.R.B.); Kingsweston Down: abundant, June 16 and 18, July 4; a few, July 7 and 17 (A.D.R.B.).

S. Priddy: several, May 29 (A.D.R.B.), common, June 10 (D.J.F.); Clevedon: abundant, July 8 (A.D.R.B.); Charterhouse: common, June 10 (D.J.F.); 10, June 30 (T. & M.S.); Brean Down: 1, June 14 (R.A.); Cheddar: common, June 12–Aug. 31 (T. & M.S.); Brockley Combe: common, June 17 (D.J.F.); Broadway: plentiful, May 28 (A.D.R.B.); Draycott: 2, May 13 (T. & M.S.); Sand Point: 3, June 11 (R.A.), 6, Sept. 9 (T. & M.S.); Berrow: 4, June 16 (R.A.); Crook Peak: at least 5, June 17 (T. & M.S.); Shipham: 3, June 14, at least 5 on July 15 (T. & M.S.); Easton-in-Gordano: numerous, June 18 (J.F.B.); Worlebury: 50, July 2 (T. & M.S.); West Huntspill: 2, Sept. 10 (T. & M.S.).

Aphantopus hyperanthus L. (Ringlet)

This is still a very local species in the Bristol district with only a few records from **G.** and **S.**, and none from within Bristol.

G. Inglestone Common: abundant, July 9, 14 and 16 (A.D.R.B.); Michael Wood: abundant, July 9 (A.D.R.B.).

S. Weston Wood: 4, Aug. 5 (R.A.); Saltford: July 30 (A.K.); Brockley Combe: large fresh colony, July 13 (D.J.F.); Goblin Combe: abundant. July 1 and 2 (A.D.R.B.); Shipham: 1, July 17 (T. & M.S.); Cheddar: common, July 9 (T. & M.S.); Clevedon: plentiful, July 8 (A.D.R.B.); Cadbury Camp: several, July 17–23 (H.H.D.); Shapwick Heath: 1, July 2 (T. & M.S.); Worlebury: July 2 (T. & M.S.); Windmill Hill, July 22 (T. & M.S.); Sandford Hill: common, July 13 (T. & M.S.).

Argynnis selene L. (Small Pearl-bordered Fritillary)

From the few records received, it appears that this butterfly is common where it occurs, but is still a local species.

G. Inglestone Common: abundant, July 9 (A.D.R.B.); Michael Wood: abundant, June 18, several, July 9 (A.D.R.B.).

S. Charterhouse: abundant, June and early July (A.D.R.B., T. & M.S., D.J.F.); Priddy: abundant, July 9 (N. J. Puzey), 1, June 10 (D.J.F.); Goblin Combe: abundant, June 17 (D.J.F.), abundant, July 1 and 2 (A.D.R.B.); Brockley Combe: June 17 and July 13 (D.J.F.); Crook Peak: one or two, June 14 and 30 (T. & M.S.); Cheddar: 1, July 9 (T. & M.S.).

Argynnis aglaia L. (Dark-green Fritillary)

A local species, but seen in reasonable numbers where it occurs, although very few records were received.

G. Stinchcombe: abundant, July 16 (A.D.R.B.).

S. Goblin Combe: 1, July 2 (A.D.R.B.); Brockley Combe: large colony, July 13 (D.J.F.); Clevedon: 1, July 8 (A.D.R.B.); Sand Point: 1, July 23 (R.A.); Brean Down: 1, July 30 (R.A.).

Argynnis paphia L. (Silver-washed Fritillary)

This is still a very rare species in the Bristol district, and very few records were received, although large numbers were seen during July in the New Forest with a high percentage of ab. *valezina* females (A.D.R.B.).

G. Fair numbers were observed in an isolated locality in central **G.** but the exact situation has not been published for conservation reasons (A.D.R.B.).

S. Cadbury Camp: 1, July 22 (H.H.D.).

Euphydryas aurinia Rott. (Marsh Fritillary)

G. Inglestone Common: larvae plentiful in spring (D.G.G.), adults plentiful on the wing in early June (D.G.G.).

S. Charterhouse: large colony, June 10 (D.J.F.), 50, June 14 (T. & M.S.). Priddy: numerous, June 10 (D.J.F.).

Limenitis camilla L. (White Admiral)

1967 was a very encouraging year as regards this species, with the sighting of several specimens in new haunts.

G. Nr. Wickwar: about 8 specimens, July 15 and 16 (A.D.R.B.).

S. Shapwick Heath: 1, July 22 (R.A.).

Vanessa atalanta L. (Red Admiral)

G. Inglestone Common: 1, July 16 (A.D.R.B.); Wotton-under-Edge: Aug. 5 (A.K.); Filton: single specimens, Sept. 27 and 28, Oct. 9, 10, 13 and 18 (R.A.); Almondsbury: 2, Sept. 14 (D.G.G.); Wick: about 6, late summer and autumn (D.R.H.); Stoke Bishop: 1, Aug. 6 (A.D.R.B.).

S. Clevedon: 2, Sept. 7 (J.F.B.); Hinton Charterhouse: several seen on *Buddleja*, late August (D.W.); Brean Down: Aug. 28 and Sept. 8 (R.A.); Weston-s-Mare: Aug. 21 (R.A.); Shapwick: May 11 (K.H.P.); Dolebury Warren: Aug. 20 (A.K.); Shipham: seen from Aug. 16 to Sept. 29, with a maximum of 9 per day (T. & M.S.); Sand Point: Aug. 6 and 20, and Sept. 17 (R.A.); Brockley Combe: 1, April 30 (D.J.F.).

Vanessa cardui L. (Painted Lady)

Very few records received for this usually abundant species.

G. Almondsbury: 1, June 14 (D.G.G.); Wick: 2, late summer (D.R.H.).

S. Cheddar: 1, Aug. 5 (M.S.).

Aglais urticae L. (Small Tortoiseshell)

1967 was another good year for this species, the first specimen being seen indoors on Feb. 18 at Shipham, **S.** (T. & M.S.). The first adult on the wing was observed in Stoke Bishop, Bristol, on Mar. 5 (A.D.R.B.), whilst the last was seen on Nov. 7 at Shipham (T. & M.S.).

Nymphalis io L. (Peacock)

This species was plentiful as usual and the first specimen was observed on Mar. 19 at Stoke Bishop, Bristol (A.D.R.B.). Another specimen was seen on the same day at Shipham, **S.** (T. & M.S.). In June, many colonies of larvae found in Stoke Bishop, producing a large second generation (A.D.R.B.).

Polygonia c-album L. (Comma)

This is still a fairly rare species in the Bristol district, as seen from the records.

G. Inglestone Common: 5, July 9 and 16 (A.D.R.B.); Michael Wood: 1, July 9 (A.D.R.B.); Stinchcombe: 2, July 16 (A.D.R.B.); Coombe Dingle: 3, Apr. 5 and 17; ova numerous, Apr. 17; 1, May 11; 4, July 17 (A.D.R.B.).

S. Goblin Combe: 1, Mar. 14 (J.F.B.), 2, Apr. 18 (A.D.R.B.); Shipham: 1, July 12, one on *Buddleja*, Aug. 16, 18, Sept. 13 and 14; one, Oct. 5, 8 and 22 (T. & M.S.); Clevedon: one female by River Yeo on July 23 (J.F.B.); Cheddar: 1, July 9 (T. & M.S.); Pill: 1, June 18 (J.F.B.).

Aricia agestis Schiff. (Brown Argus)

G. A search was made at a well-known locality in the Cotswolds, but without success (A.D.R.B.).

S. Brockley Combe: June 17 (D.J.F.); Dolebury Warren: Aug. 20 (A.K.); Goblin Combe: plentiful, although worn on July 1 and 2 (A.D.R.B.); Clevedon: 3, July 8 (A.D.R.B.); one fresh female on Wain's Hill, Aug. 28 (J.F.B.); Shipham: many single specimens, June 12 to mid-July, 2 on Aug. 6 and 31, one on Sept. 12, 14 and 18, two on Sept. 21 (T. & M.S.); Cheddar: plentiful on June 12, 5 on July 1, and 2 on Aug. 31 (T. & M.S.); Draycott: 1, Aug. 30 (T. & M.S.).

Polyommatus icarus Rott. (Common Blue)

G. Filton: June 6, Aug. 4 and 8, 3 on Aug. 9, 14, 15, 21, 25 and Sept. 27 (R.A.), abundant on June 10, several on July 11 (A.D.R.B.); Inglestone Common: numerous, July 9, one worn female, July 16 (A.D.R.B.); Avon Gorge: one worn female on Aug. 8 (T. & M.S.); Kingsweston Down: 2, June 16 (A.D.R.B.).

S. Goblin Combe: plentiful, July 1 and 2 (A.D.R.B.), seen on June 17 (D.J.F.); Brockley Combe: June 17 and July 13 (D.J.F.); Brean Down: 2, July 30, 6 on Aug. 13, 2 on Aug. 29, and 3 on Sept. 3 (R.A.); Sand Point: noted on Aug. 6 and 10, 2 on Aug. 28 (R.A.), 3 on Sept. 9 (T. &

M.S.); Charterhouse: June 10 (D.J.F.), June 17 (T. & M.S.); Cadbury Camp: 1, June 26 (H.H.D.); Shapwick: 1, June 3 (R.A.); Saltford: June 10, Aug. 9 and Sept. 9 (A.K.); Clevedon: one male on Wain's Hill, July 22, several on Aug. 28 (J.F.B.); Dolebury Warren: Aug. 20 (A.K.); Draycott: at least 10, Aug. 30 (T. & M.S.); Meare Heath: two females on Aug. 18, several males on Aug. 21 (J.F.B.); Crook Peak: 2, June 17 (T. & M.S.); Shipham: fair numbers, June 5 to Sept. 21 (T. & M.S.); Dulcote Hill, near Wells: June 10 (A.K.); Cheddar: plentiful, June 12, numerous, Aug. 31 (T. & M.S.).

Lysandra coridon Poda (Chalkhill Blue)

G. Wotton-under-Edge: common, including 6 females on Coombe Hill, Aug. 5 (A.K.); Inglestone Common: 2 males on Aug. 5 (A.K.).

S. Brean Down: 10, July 30, 1 on Aug. 13 (R.A.); Draycott: 5, including 4 females, on Aug. 30 (T. & M.S.); Windmill Hill: at least 10, July 22 (T. & M.S.).

Lysandra bellargus Rott. (Adonis Blue)

S. Sand Point: 1, June 11 (R.A.).

Celastrina argiolus L. (Holly Blue)

A widespread but still very scarce species.

G. Michael Wood: a few, Aug. 6 (D.G.G.); Coombe Dingle: 1, Apr. 5, 1 female on May 11, 3 on Apr. 17 (A.D.R.B.); Wick: 1, Apr. 16 (D.R.H.); Stoke Bishop: 1, Aug. 6 (A.D.R.B.).

S. Weston Wood: 1 on Aug. 6 and 20 (R.A.); Weston-s-Mare: seen by schoolboy on Apr. 6 (K.H.P.), also seen on July 23 and Aug. 6 (K.H.P.); Cadbury Camp: 1, July 23 (H.H.D.); Saltford: 2, July 30, in all parts of village on Aug. 20 (A.K.); Draycott: 1, Apr. 16, 2, May 13 (T. & M.S.); Sand Point: 3, July 30 (T. & M.S.); Shipham: seen from Apr. 17 to May 12 with a max. of 4, also from July 21 to Aug. 17 with a max. of 6 (T. & M.S.); Cheddar: 1, Apr. 30 and June 12, 2, July 17, at least 3, July 23, 1, Aug. 5, 2, Aug. 31 (T. & M.S.).

Cupido minimus Fuessl. (Small Blue)

G. Filton: 1, at Haw Wood, Aug. 6 and 20 (R.A.).

S. Worlebury: 6, July 2 (T. & M.S.); Shipham: 1, June 13, 16 and 19 (T. & M.S.).

Lycaena phlaeas L. (Small Copper)

G. Filton: 1, June 10; 10 larvae on Nov. 19 (A.D.R.B.); Inglestone Common: 2, Aug. 5 (A.K.); Blaise Castle Estate: 1, May 6 (A.D.R.B.); Stoke Bishop: 1, Aug. 5 and 10 (A.D.R.B.); Wick: 2 or 3 in July (D.R.H.).

S. Charterhouse: June 10 (D.J.F.); Shipham: first, Apr. 30: last, Oct. 26 (two). Max. numbers in early Aug.—40 counted in small area on 5th, 9, Sept. 27, 10 on Oct. 5; Brockley Combe: June 17 (D.J.F.); Meare Heath: 2 or 3, Aug. 18 and 21 (J.F.B.); Clevedon: 2, Aug. 28 (J.F.B.); Sand Point: 1, June 11 and July 16 (R.A.), Sept. 9 (T. & M.S.); Sand Bay: 1, Aug. 13 (R.A.); Dolebury Warren: Aug. 20 (A.K.); Yatton: 1, July 31 (H.H.D.); Weston-s-Mare: Sept. 21 (K.H.P.); Westhay: Sept. 30 (T. & M.S.); Chew Valley Lake: 1, Sept. 2 (T. & M.S.); Wick St. Lawrence: 1, Sept. 23 (T. & M.S.).

Callophrys rubi L. (Green Hairstreak)

S. Goblin Combe: few, Apr. 18 (A.D.R.B.); Charterhouse: 2, June 10

(D.J.F.); Shipham: 1, June 15 and 16 (T. & M.S.); Cheddar: at least 8, Apr. 30, 3, July 1, 3, July 9 (T. & M.S.).

Thecla quercus L. (Purple Hairstreak)

G. Henbury Golf Course: 1 larva beaten from oak, May 30 (C.W.W.).

S. Leigh Woods: 2 larvae, May 30 (A.D.R.B.); Cheddar: 1, July 23 (T. & M.S.); Brockley Combe: oak trees beaten for larvae but with negative result (D.J.F.).

Strymonidia w-album Knoch (White Letter Hairstreak)

G. Nr. Gloucester: 3 larvae beaten from small wych elm, May 14 (A.D.R.B.); Avon Gorge: 1 larva, May 18 (A.D.R.B.); Kingsweston Down: 1, July 7 (C.W.W.); Coombe Dingle: 1, June 28 (A.D.R.B.).

Pieris brassicae L. (Large White)

In good numbers in most places but less plentiful than in 1966.

Pieris rapae L. (Small White)

Abundant everywhere during 1967, the first specimen being seen on Apr. 5 (A.D.R.B.).

Pieris napi L. (Green-veined White)

Another good year for this species, with specimens from both broods seen in most usual localities.

Colias croceus Fourc. (Clouded Yellow)

Only three records were received for this species, although it was fairly plentiful in Dorset and on the Isle of Wight during August (A.D.R.B.).

G. Inglestone Common: 1 female, July 9 (A.D.R.B.); Littleton-on-Severn: 1, Aug. 21 (D.G.G.); Wick: 1, August (D.R.H.).

Anthocharis cardamines L. (Orange Tip)

Once again, many specimens were seen in the Bristol district during the spring, and a gynandrous female was taken at Inglestone Common on Apr. 16 (D.G.G.).

Gonepteryx rhamni L. (Brimstone)

Many specimens were recorded from in and around Bristol, indicating a good year for this species. The first specimen seen was a male on Feb. 17 (C.W.W.), a very early date. A single larva was taken at Clevedon on July 8 (A.D.R.B.).

Erynnis tages L. (Dingy Skipper)

G. Filton: abundant, June 10 (A.D.R.B.).

S. Goblin Combe: June 17 (D.J.F.); plentiful but worn, July 1 and 2 (A.D.R.B.); Charterhouse: June 10 (D.J.F.); Priddy: 1, May 29 (A.D.R.B.); Dulcote Hill, nr. Wells: June 10 (A.K.); Brockley Combe: June 17 (D.J.F.); Cheddar: 1, April 30; 2, June 12 (T. & M.S.); Draycott: 1, May 13 (T. & M.S.); Shipham: single specimens, May 10 and June 14 (T. & M.S.).

Pyrgus malvae L. (Grizzled Skipper)

S. Brockley Combe: 1, Apr. 30 (A.K.); June 17 (D.J.F.); Goblin Combe: numerous, Apr. 18 (A.D.R.B.); abundant, but worn, July 1 and 2 (A.D.R.B.); Cheddar: 2, June 12 (T. & M.S.); Kewstoke Wood; Weston: June 12 (D.J.F.); Shipham: 1, May 10 (T. & M.S.).

Thymelicus sylvestris Poda (Small Skipper)

G. Inglestone Common: several, July 9; abundant, July 14 and 16 (A.D.R.B.); Aug. 5 (A.K.); Wotton-under-Edge: Aug. 5 (A.K.); Michael Wood: plentiful, Aug. 6 (D.G.G.); abundant, July 9 (A.D.R.B.); Kingsweston Down: abundant, July 7, 13 and 17 (A.D.R.B.).

S. Clevedon: one, July 16 (J.F.B.); abundant, July 8 (A.D.R.B.); Brockley Combe: numerous: July 13 (D.J.F.); Goblin Combe: several, July 2 (A.D.R.B.); Cheddar: fairly common, July 17–Aug. 5 (T. & M.S.); Shipham: 1, July 21 and Aug. 5, 6, 9 (T. & M.S.); Charterhouse: 2, June 30 (T. & M.S.); Windmill Hill: 2, July 22 (T. & M.S.).

Ochlodes venata Br. & Grey (Large Skipper)

G. Inglestone Common: several, July 16 (A.D.R.B.); Filton: 2, June 10 (A.D.R.B.); Kingsweston Down: abundant, June 6, 28, 29 and July 13 (A.D.R.B.); Avon Gorge: 1, July 11 (T. & M.S.); Durdham Down: 1, June 7 (A.D.R.B.).

S. Goblin Combe: June 17 (D.J.F.); abundant, July 1 and 2 (A.D.R.B.); Sandford Hill: 1, July 13 (T. & M.S.); Kewstoke Wood, Weston: June 12 (D.J.F.); Dulcote Hill, nr. Wells: June 10 (A.K.); Cheddar: fairly common, July 1–17 (T. & M.S.); Crook Peak: 1, June 17 (T. & M.S.); Worlebury: 20, July 2 (T. & M.S.); Shipham: single specimens, June 13 and July 14, 2, July 21 (T. & M.S.).

MOTHS

By K. H. Poole

THE following records have been selected from those contributed by C. S. H. Blathwayt (C.S.H.B.), D. G. Gibb (D.G.G.), R. Hayward (R.H.), A. Kennard (A.K.), K. H. Poole (K.H.P.) and T. B. Silcocks (T.B.S.). Very few migrant moths have been noted. Unless otherwise stated, single specimens were recorded, and those taken at light marked by an asterisk.

Harpyia hermelina Goeze (Poplar Kitten). Saltford, June 13, 16* (A.K.); Shipham, June 6, 7* (T.B.S.).

Stauropus fagi L. (Lobster Moth). Milton, Weston-s-Mare, June 21, 23* (K.H.P.); Shipham, July 10*, Cheddar Wood, July 11, 13* (T.B.S.).

Tethea octogessima Hb. (Figure of Eighty). Almondsbury, June 18, 30, July 4* (D.G.G.); Saltford, June 16* (A.K.); Milton, Weston-s-Mare, June 23, July 2* (K.H.P.).

Arctia villica L. (Cream-Spot Tiger). Milton, Weston-s-Mare, June 14* (K.H.P.).

Atolmis rubricollis L. (Red-Necked Footman). Goblin Combe, June 17 (6) (D.G.G.).

Apatele alni L. (Alder Moth). Shipham, June 7, 15 (2)* (T.B.S.).

Anaplectoides prasina Schiff. (Green Arches). Cheddar Wood, June 16–July 30 (44)* (T.B.S.).

Polia nitens Haw. (Pale Shining Brown). Saltford, June 27* (A.K.).

Hadena contigua Schiff. (Beautiful Brocade). Cheddar Wood, July 13, 14, 17* (T.B.S.).

Dasypolia templi Thunb. (Brindled Ochre). Shipham, Nov. 13* (T.B.S.).

Antitype chi L. (Grey Chi). Saltford, Aug. 9, 20 (A.K.); Almondsbury, Aug. 27 (2)* (D.G.G.).

Apamea furva Schiff. (The Confused). Cheddar Wood, July 7, 11, 13 (2)* (T.B.S.).

Xylophasia remissa Hb. (Dusky Brocade). Milton, Weston-s-Mare, July 11* (K.H.P.); Shipham and Cheddar Wood,* (T.B.S.).

Leucania vitellina Hb. (Delicate Wainscot). Shipham, Sept. 27* (T.B.S.).

Panolis flammea Schiff. (Pine Beauty). Shipham, May 12* (T.B.S.).

Orthosia advena Schiff. (Northern Drab). Shipham, March 22–May 12 (81)*, Cheddar Wood, Apr. 30* (T.B.S.).

Cosmia pyralina Schiff. (Lunar-Spotted Pinion). Shipham, July 16, 19, 29*, Cheddar Wood, July 22* (T.B.S.).

Atethmia xerampelina Esp. (Centred-Barred Sallow). Saltford, Sept. 9, 13, 14* (A.K.); Shipham, Aug. 30–Sept. 11 (9)* (T.B.S.).

Pyrrhia umbra Hufn. (Bordered Sallow). Saltford, June 16* (A.K.); Shipham, June 22* (T.B.S.).

Rivula sericealis Scop. (Straw Dot). Milton, Weston-s-Mare, Aug. 8, 10* (K.H.P.); Shipham, June 28, July 16 (2)*, Cheddar Wood, Aug. 11 (3)* (T.B.S.).

Plusia bractea Schiff. (Gold Spangle). Shipham, July 21* (T.B.S.). This appears to be the first record for Somerset.

Ophiusa pastinum Treit. (The Blackneck). Almondsbury, July 5* (D.G.G.); Shipham, July 10, 12, 15, 25, 29*, Cheddar Wood, July 22* (T.B.S.).

Brephos notha Hb. (Light Orange Underwing). Wickwar, Apr. 17 (D.G.G.).

Sterrha seriata Schr. (Small Dusty Wave). Saltford, Sept. 14, 15 (A.K.).

Cosymbia linearia Hb. (Clay Triple Lines). Shipham, July 23* (T.B S).

Larentia cervinalis Scop. (Mallow Moth). Bath, Apr. 29* (R.H.).

Triphosa dubitata L. (The Tissue). Saltford, Apr. 28* (A. K.); Cheddar Wood, Aug. 17–Oct. 7 (6)* (T.B.S.).

Lygris pyraliata Schiff. (Barred Straw). Shipham, Aug. 10*, Cheddar Wood, Aug. 13* (T.B.S.).

Colostygia didymata L. (Twin-Spot Carpet). Shipham, July 23* (T.B.S.).

C. olivata Schiff. (Beech-Green Carpet). Cheddar Wood, Aug. 15–Sept. 3* (16) (T.B.S.).

Eupithecia venosata Fab. (Netted Pug). Saltford, June 12* (A.K.).

E. expallidata Doubld. (Bleached Pug). Cheddar Wood, Aug. 9–13* (T.B.S.).

E. haworthiata Doubld. (Haworth's Pug). Shipham, Aug. 2* (T.B.S.).

E. inturbata Hb. (Maple Pug). Saltford, July 28, Aug. 1 (A.K.).

E. innotata Hufn. (Angle-Barred Pug). Saltford, June 15 (A.K.).

Abraxas sylvata Scop. (Clouded Magpie). Ebbor Rocks, Wells, June 4 (A.K.); Cheddar Wood, June 19–Aug. 11 (T.B.S.).

Ligdia adustata Schiff. (Scorched Carpet). Bath, Apr. 28* (R.H.).

Selenia lunaria Schiff. (Lunar Thorn). Weston-s-Mare, June 10* (C.S.H.B.); Saltford, May–June, frequent* (A.K.).

Apocheima hispidaria Schiff. (Small Brindled Beauty). Bath, Mar. 3* (R.H.).

Lycia hirtaria Cl. (Brindled Beauty). Bath, Apr. 29* (R.H.).

Ectropis luridata Borkh. (Brindled White Spot). Milton, Weston-s-Mare, June 14* (K.H.P.).

Pachycnemia hippocastanaria Hb. (The Horse-Chestnut). Milton, Weston-s-Mare, Aug. 10* (K.H.P.).

Zeuzera pyrina L. (Leopard Moth). Saltford, July 8* (A.K.); Shipham, July 19* (T.B.S.).

Hepialus fusconebulosa Deg. (Mapwinged Swift). Shipham, June 22* (T.B.S.).

Crambus falsellus Schiff. Saltford, Aug. 9 (A.K.).

C. inquinatellus Schiff. Dolebury Warren, Churchill, Aug. 8 (A.K.).

Acentropus niveus Oliv. Saltford, July 18* (A.K.).

Perinephela lancealis Schiff. Saltford, June 18 (A.K.).

Nomophila noctuella Schiff. Bath, March 17* (R.H.). An early date.

Pyrausta nigrata Scop. Ebbor Rocks, Wells, June 4 (A.K.); Shipham, July 27* (2) (T.B.S.).

P. aurata Scop. Coombe Hill, Wotton-under-Edge, Aug. 5 (A.K.).

P. asinalis Hubn. Cheddar Wood, July 22, Aug. 1* (T.B.S.).

Evergistis pallidata Hufn. Saltford, July 30 (A.K.).

Laspeyresia nigricana F. Saltford, June 10 (A.K.).

Lobesia reliquana Hubn. Saltford, July 19 (A.K.).

Anarsia spartiella Schrank. Saltford, July 28 (A.K.).

Heliozela betulæ Staint. Brockley Combe, Apr. 4 (A.K.).

Elachista atricomella Staint. Saltford, June 1 (A.K.).

Argyresthia spiniella Zell. Saltford, June 16 (A.K.).

A. ephippella F. Saltford, July 25 (A.K.).

Lithocolletis sorbi Frey. Brockley Combe, Apr. 30 (A.K.).

L. lantanella Schrank. Holcombe, nr. Radstock, Apr. 29 (A.K.).

Correction to Lepidoptera Notes, 1966, Moths:
Delete "*Perizoma tæniata* Steph. (Barred Carpet). Shipham, Aug. 31* (T.B.S.)."

MAMMAL SURVEY BRISTOL DISTRICT, 1967

By Roger G. Symes

THE year's most encouraging development was the increase in the number of records to 697, some containing several observations. There were many extra reports from outside the survey area, the limits of which Miss Jones (1967) described when she gave the results of the first two years' observations.

Localities of all records are plotted in 1 km. squares on maps for the current year which will include reports received too late for inclusion here. A composite map is also maintained on which records from previous years are plotted (such records are still required). One record per 10 km. square, both from within and outside the survey area, is forwarded to the Mammal Society of the British Isles.

RESULTS

Figures indicate numbers of records received. **B**—City of Bristol; **G**—South Gloucestershire; **S**—North Somerset.

		B	G	S
Hedgehog	*Erinaceus europaeus*	27	22	52
Mole	*Talpa europaea*	6	43	98
Common Shrew	*Sorex araneus*	2	6	16
Pigmy Shrew	*S. minutus*	—	2	3
Lesser Horseshoe Bat	*Rhinolophus hipposideros*	—	—	2
Noctule	*Nyctalus noctula*	—	—	1*
Pipistrelle	*Pipistrellus pipistrellus*	—	—	1*
Rabbit	*Oryctolagus cuniculus*	2	23	45
Brown Hare	*Lepus capensis (europaeus)*	1	4	22
Grey Squirrel	*Sciurus carolinensis*	18	4	28
Bank Vole	*Clethrionomys glareolus*	—	2	5
Short-tailed Vole	*Microtus agrestis*	1	3	11
Water Vole	*Arvicola amphibius*	4	7	7
Long-tailed Field Mouse	*Apodemus sylvaticus*	3	2	9
Yellow-necked Mouse	*A. flavicollis*	—	—	1
House Mouse	*Mus musculus*	4	9	1
Ship Rat	*Rattus rattus*	2	—	—
Common Rat	*R. norvegicus*	6	4	18
Fox	*Vulpes vulpes*	23	38	16
Stoat	*Mustela erminea*	1	—	11
Weasel	*M. nivalis*	—	2	11
American Mink	*M. vison*	—	—	15
Badger	*Meles meles*	2	22	26
Otter	*Lutra lutra*	1	—	—
Grey Seal	*Halichoerus grypus*	1	—	—

* Flight record only

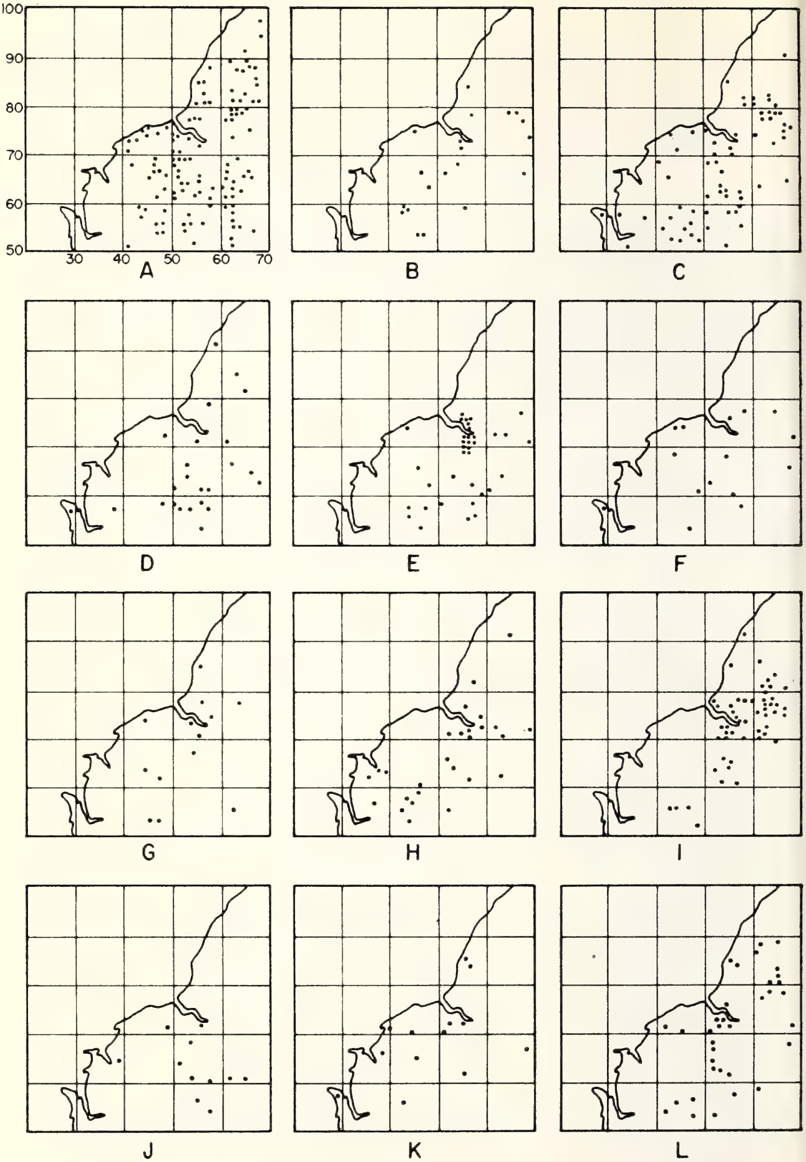
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Fig. 1. *Distribution of mammals in the Bristol area, 1967.*
A: Mole; B: Common Shrew; C: Rabbit; D: Brown Hare; E: Grey Squirrel; F: Short-tailed Vole; G: Long-tailed Field Mouse; H: Common Rat; I: Fox; J: Stoat; K: Weasel; L: Badger. Each dot represents at least one record per sq. km.

INSECTIVORA

The distribution of Hedgehog and Mole (Fig. 1A) is widespread. Most records of Hedgehog were of animals killed on roads, there being two peaks in numbers in April–May and July–September, corresponding with those shown by Davies (1957). Brockie (1960) pointed out that the highest mortality rate appears to occur before the advent of litters and is probably a reflection of increased activity associated with the breeding season. There was a great increase in numbers of Mole records over the previous two years, nearly all being of fresh molehills seen in January and February. Whilst a wide distribution is indicated for Common Shrew (Fig. 1B), many more records are needed before the suggestion of Tetley (1941) can be substantiated that this is probably the commonest mammal in the district. Pigmy Shrew records were from widely separated localities.

LAGOMORPHA

Widespread distribution is shown for both Rabbit (Fig. 1C) and Brown Hare (Fig. 1D). Most records were of sightings of living animals.

RODENTIA

Distribution of Grey Squirrel (Fig. 1E) appears widespread but more reports are needed from Gloucestershire and the coastal area of Somerset. Records of Bank Vole and Short-tailed Field Vole (Fig. 1F) were mostly from bottles. Bank Vole was found in only three 10 km. squares although Tetley (1941) recorded it as very common. Records from six 10 km. squares were received for Water Vole, remains of which Tetley (1941) found in 22 out of 26 Heron pellets, a source which may be worth further investigation. Long-tailed Field Mouse (Fig. 1G), House Mouse, and Common Rat (Fig. 1H) are all widespread in distribution.

CARNIVORA

Records for Fox, Stoat, Weasel and Badger (Fig. 1, I–L) show these species to have a wide distribution, whilst those for American Mink indicate that it was local, in much the same area as plotted by Jones (1967).

Twenty-five species of mammals were recorded in the Bristol area in 1967. There were no reports of Water Shrew (*Neomys fodiens*), Harvest Mouse (*Micromys minutus*) and Dormouse (*Muscardinus avellanarius*), all of which were recorded in the previous two years. Reports of bats were very few and none was received for any species of deer. Further systematic surveys, advocated by Jones (1967), should increase the numbers of records of small mammals especially. Corbet (1964) claimed that it would be difficult to find a few square miles anywhere on the British mainland with fewer than 10 species, so further surveys should be well rewarded.

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I thank all who have contributed records and especially those members of the Mammal Section who by their keen field work have helped to maintain interest at a high level.

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LIGHT-TRAPPING OF LEPIDOPTERA ON MENDIP

By Trevor B. Silcocks

DURING 1967 intensive light-trapping was carried out at two sites on the Mendips in different habitats. The sites were in a garden at Shipham (National Grid Square 44/57) and in Cheddar Wood (45/55), 1½ miles distant.

At Shipham a 125-watt mercury vapour lamp was used, whilst a 6-watt ultra violet light was run in the wood. The m.v. lamp emits a more powerful light than the u.v., but the latter nevertheless attracts a large number of moths (see Table 1). The largest catches totalled 550 and 302 respectively.

Cheddar Wood is predominantly a mixture of ash, oak and small-leaved lime. The trap was sited about 50 yards from the Shipham-Cheddar road. The Shipham garden is on the edge of the village, bordering rough grazing and pasture land and near an area of gruffy ground (old opencast mining remains). The latter has scrub and thickets, containing much ash, blackthorn and bramble with frequent dogwood, spindle and holly.

Table 1 shows the number of nights on which the traps were used each month. No trapping was done at the wood until April 8. All catches were examined and counted at Shipham, but most were later returned. A number inevitably escaped, mainly Geometrids, but the totals of, for example, *Alcis repandata* L. suggest that this did not invalidate comparisons. Lights were generally run from soon after, but occasionally from up to 2 hours after, dusk to dawn. Insects around the traps were collected soon after dawn nearly always before the arrival of birds. On one occasion a bat was seen circling over a trap.

The list shows the first and last dates for each species or, for occasional visitors, the actual dates, the numbers of insects being given in parenthesis if more than one. The total columns show the number of individuals counted at each site. It is confined to the so called "macrolepidoptera" and some species of Pyralidae. Where numbers were thought inaccurate for some critical species these have been omitted but are listed in the Appendix.

In spite of the different lights used, the list provides a useful comparison of abundance at (or absence from) the two habitats as well as putting on record results from an area where little light-trapping has hitherto been done.

TABLE 1

	Shipham		Cheddar Wood	
	No. of nights	Total moths	No. of nights	Total moths
Jan.	7	14		
Feb.	17	75		
Mar.	26	233		
Apr.	28	1,544	8	472
May	26	902	1	42
June	14	2,865	9	932
July	14	4,291	14	2,754
Aug.	11	2,060	10	1,094
Sept.	26	2,785	6	305
Oct.	28	514	6	240
Nov.	30	125	5	196
Dec.	12	179	6	414
TOTALS:	239	15,587	65	6,449

The Cheddar December total includes a remarkable catch for the time of year of 204 moths (Silcocks, 1968).

SYSTEMATIC LIST OF SPECIES RECORDED AT LIGHT

Nomenclature: Sphingidae to Hepialidae—A.E.S. Check List 1946
Pyralidae—Beirne, 1952.

	SHIPHAM		CHEDDAR	
	Dates	Total numbers	Dates	Total numbers
SPHINGIDAE				
Mimas tiliae L.	June 22	1		
Laothoe populi L.	May 10–Aug. 4 and Sept. 1	18	July 14	2
Smerinthus ocellata L.	June 7, 9	2		
Sphinx ligustri L.	June 6 –July 16	21	July 1, 5, 9	3
Deilephila porcellus L.	May 13–July 19	54		
D. elpenor L.	June 6, 22, July 6, 14, 19	6		
NOTODONTIDAE				
Harpyia hermelina Goeze	June 6, 7	2		
Cerura vinula L.	June 8	1		
Stauropus fagi L.	July 10	1	July 11, 13	2
Chaonia ruficornis Hufn.	Apr. 18–May 14	9	Apr. 27	1
Notodonta ziczac L.	June 7–Aug. 16	8		
N. dromedarius L.	June 6–July 27	6	July 14	1
Lophopteryx capucina L.	May 11–Aug. 6 and Sept. 1	23	June 6–Aug. 17	69
Pterostoma palpina Cl.	May 14, 16, June 28, and Aug. 18	4		
Phalera bucephala L.	May 13–July 29	72	June 23–July 26	13
THYATIRIDAE				
Habrosyne pyritoides Hufn.	July 4–Aug. 6	120	June 25 (2), July 13 –Aug. 1	45
Thyatira batis L.	July 2–31	7	June 6–July 24	15

	SHIPHAM		CHEDDAR	
	Dates	Total numbers	Dates	Total numbers
Dasychira pudibunda L.	May 26–June 28	28	June 6–23	14
Euproctis similis Fuessly	July 15–Aug. 14	19	July 24–Aug. 1	4
LASIOCAMPIDAE				
Malacosoma neustria L.	July 6–Aug. 6	53		
Poecilocampa populi L.	Jan. 12, Nov. 21–Dec. 25	134	Nov. 11–Dec. 25	75
Philudoria potatoria L.	July 6–Aug. 10	33	July 7–Aug. 11	10
DREPANIDAE				
Drepana binaria Hufn.	Aug. 10	1	Aug. 13	1
Cilix glaucata Scop.	June 6, 15, July 21–Aug. 16	11	June 19	1
NOLIDAE				
Nola cucullatella L.	July 12–23	7		
AGROTIDAE				
Bena fagana Fab.			June 16	1
ARCTIIDAE				
Spilosoma lubricipeda L.	May 12–July 16	243	June 16–July 13	15
S. lutea Hufn.	June 6–Aug. 10	241	June 16–July 9	13
Cycnia mendica Cl.	Apr. 19–June 9	31		
Phragmatobia fuliginosa L.	July 19–Aug. 14	38		
Arctia caja L.	July 2–Aug. 10	124	July 14, 26	2
Callimorpha jacobaeae L.	June 8–July 4	18	June 16	1
Nudaria mundana L.	July 6–23	15	June 25, July 22–30	7
Miltochrista miniata Forst.	July 12, 23, 29 (2)	4	July 30	1
Eilema griseola Hb.	Aug. 4, 8, 10, Sept. 1	4	July 30, Aug. 3, 7	3
E. complana L.			July 17, Aug. 9	2
E. lurideola Zinck.	July 12–Aug. 16	66	July 17, Aug. 1	2
NOCTUIDAE				
Colocasia coryli L.	May 12–June 7, July 27–Aug. 8	12	May 10–Aug. 17	13
Apatele megacephala Schiff.	July 12	1		
A. alni L.	June 7, 15 (2)	3		
A. rumicis L.	June 14–Aug. 30	13	July 30	1
Craniophora ligustri Schiff.	July 15, 25 (ab. *olivacea*)	2	July 13, Aug. 15	2
Cryphia peria Schiff.	July 12–Sept. 1	7	July 13	3
Agrotis segetum Schiff.	Sept. 3–Oct. 27	20	Sept. 1, 3	2
A. clavis Hufn.	June 15–July 23	23	June 16–July 14	25
A. puta Hb.	May 12–June 20, July 31–Sept. 12	52		
A. exclamationis L.	June 12–Aug. 19	412	June 16–July 17	45
A. ipsilon Hufn.	June 8–Oct. 13	86	June 26, July 14	2
Euxoa nigricans L.	July 23–Sept. 1	10		
Lycophotia varia Vill.	June 20–July 29	32	June 16–July 14	11
Peridroma porphyrea Schiff.	Sept. 11–Oct. 24	16	July 1, Oct. 7	2
Amathes glareosa Esp.	Sept. 3–30	52	Sept. 9, 13, 24	3
A. baja Schiff.	Aug. 2–10	7	July 9–Aug. 17	57
A. c-nigrum L.	May 13–Oct. 12	187	Sept. 1	1
A. triangulum Hufn.	June 28–Aug. 18	91	June 16–Aug. 9	237
A. sextrigata Haw.	Aug. 16–Sept. 2	11		

	SHIPHAM		CHEDDAR	
	Dates	Total numbers	Dates	Total numbers
A. xanthographa Schiff.	Aug. 6–Sept. 25	319	Aug. 30–Sept. 24	34
Diarsia brunnea Schiff.	July 2	1	June 26–July 22	18
D. festiva Schiff.	June 6–July 6	341	June 6–July 7	153
D. rubi Vieweg	Aug. 6–Sept. 29	509	Aug. 17–Sept. 13	16
Ochropleura plecta L.	Apr. 27–Sept. 16	308	June 16–Aug. 1	13
Triphaena comes Hb.	July 16–Sept. 28 and Oct. 30	86	Aug. 9–Sept. 13	14
T. janthina Schiff.	July 19–Sept. 2	122	July 22–Sept. 1	104
T. interjecta Hb.	Aug. 2–19	13	July 26, Aug. 3	2
T. pronuba L.	June 24–Sept. 29	917	June 25–Sept. 24	195
Lampra fimbriata Schreb.	Aug. 2, 10 (2), Sept. 15	4		
Axylia putris L.	June 6–July 12 (53)	333	June 16–July 30	20
Anaplectoides prasina Schiff.			June 16–July 13	44
Polia nebulosa Hufn.	July, 4, 19	2	June 16–July 17	52
Mamestra brassicae L.	May 21–Sept. 24	98	June 16–Aug. 7	10
Melanchra persicariae L.	June 24–Aug. 2	72	July 1–30	22
Diataraxia oleracea L.	June 20–Aug. 6	52	June 21–July 14	9
Ceramica pisi L.	June 6–July 25	69	June 6, 16, 23	3
Hada nana Hufn.	May 18–July 2	70	June 16–July 13	31
Hadena w-latinum Hufn.	May 12–July 16	83	June 6–July 20	78
H. contigua Schiff.			July 13, 14, 17	3
H. serena Schiff.	June 14–Aug. 6	16		
H. bicruris Hufn.	June 9–Aug. 19	97	Aug. 9, 17	2
H. cucubali Schiff.	June 13, 15, Aug. 2	3		
Tholera popularis Fab.	Aug. 30–Sept. 14	40	Sept. 3	1
T. cespitis Schiff.	Aug. 14–Sept. 26	58	Sept. 3–9	3
Cerapteryx graminis L.	July 23–Aug. 8	6		
Thalpophila matura Hufn.	July 16–Aug. 18	16	July 17–Aug. 9	6
Dryobotodes protea Schiff.	Sept. 10, 12	2		
Episema caeruleocephala L.	Oct. 9–24	3		
Luperina testacea Schiff.	Aug. 2–Sept. 18	24	Aug. 30	1
Aporophila nigra Haw.	Sept. 22–Nov. 4	13	Aug. 7, 8	2
Dasypolia templi Thunb.	Nov. 13	1		
Antitype flavicincta Schiff.	Sept. 16–Oct. 7	16		
A. chi L.	Sept. 1	4	Sept. 1	2
Brachyonycha sphinx Hufn.	Oct. 21–Nov. 25	33	Nov. 6–12	30
Allophyes oxyacanthae L.	Oct. 3–23	17	Oct. 7–29	18
Euplexia lucipara L.	June 14–July 29	46	June 16–July 22	11
Phlogophora meticulosa L.	Apr. 9–Nov. 30	474	June 6–Nov. 11	17
Apamea furva Schiff.			July 7, 11	2
A. obscura Haw.	June 15–July 25	7	June 27	1
A. sordens Hufn.	June 6–24	88	June 6–July 3	24
A. unanimis Hb.	May 14	2		
A. crenata Hufn.	June 9–July 2	33	June 16–29	5
A. lithoxylaea Schiff.	June 15–July 31	62	July 13 (4), 14	5
A. sublustris Esp.	July 6	1	June 19–July 24	20
A. monoglypha Hufn.	June 15–Sept. 10	521	June 29–Sept. 13	55
A. characterea Hb.	July 6	1	July 14	1
A. secalis L.	July 2–Sept. 1	246	July 13–Sept. 3	66
Procus fasciuncula Haw.	June 12–July 12	53	June 21–July 13	5
P. literosa Haw.	July 25–Aug. 19	40	Aug. 1	1
P. furuncula Schiff.			Aug. 9	1
Petilampa minima Haw.	July 4	1		
Hydraecia micacea Esp.	Aug. 6–Oct. 24	180	Sept. 3, 9	2
Gortyna flavago Schiff.	Sept. 10–Oct. 26	17	Oct. 7	1
Arenostola pygmina Haw.	Aug. 31	1		

	SHIPHAM		CHEDDAR	
	Dates	Total numbers	Dates	Total numbers
Leucania pallens L.	June 24–Oct. 6	102	July 9–Aug. 1	10
L. impura Hb.	July 4–Aug. 18	135	June 29–July 26	11
L. comma L.	June 8–July 6	11		
L. vitellina Hb.	Sept. 27	1		
L. lithargyria Esp.	July 4–Aug. 19	49	July 13–Aug. 11	13
L. conigera Schiff.	July 21–Sept. 1	6	July 24	1
Meristis trigrammica Hufn.	June 6–July 2	168	June 16–25	7
Caradrina morpheus Hufn.	July 12–23	7		
C. clavipalpis Scop.	July 27–Sept. 30	41		
Rusina umbratica Goeze	June 6–July 6	45	June 16–29	6
Amphipyra pyramidea L.	Aug. 30, Sept. 15	2	Aug. 30–Sept. 24	15
A. tragopoginis Cl.	Sept. 2, 3, 5, 23	4	Aug. 11, Sept. 1 (2)	3
Panolis flammea Schiff.	May 12	1		
Cerastis rubricosa Schiff.	Mar. 7–May 19	46		
Orthosia gothica L.	Feb. 1, 2, 26–June 14	1,468	Apr. 8–May 10	161
O. cruda Schiff.	Mar. 25–May 5	20	Apr. 8–30	7
O. stabilis Schiff.	Mar. 30–May 19	116	Apr. 8–30	45
O. incerta Fab.	Mar. 16–May 23	270	Apr. 8–May 10	140
O. munda Schiff.	Apr. 9–27	8	Apr. 14–30	9
O. advena Schiff.	Mar. 22–May 12	81	Apr. 30	1
O. gracilis Schiff.	Apr. 15–May 26	79	Apr. 8, 30 (2)	3
Cosmia pyralina Schiff.	July 16, 19, 29	3	July 22	1
C. trapezina L.	July 21, Sept. 5	2	July 30–Sept. 6	62
Zenobia retusa L.	July 23	1		
Atethmia xerampelina Esp.	Aug. 30–Sept. 11	9		
Omphaloscelis lunosa Haw.	Sept. 1–Oct. 16	76		
Agrochola lota Cl.			Oct. 13, Nov. 6	2
A. macilenta Hb.	Oct. 25–Dec. 2	9	Oct. 8–Dec. 6	26
A. circellaris Hufn.			Oct. 29	1
A. lychnidis Schiff.	Sept. 25–Nov. 28	209	Sept. 13–Oct. 13	7
Anchoscelis litura L.	Sept. 18–Oct. 21	15		
Tilacea citrago L.			Oct. 7, 8	2
T. aurago Schiff.	Sept. 29	1		
Citria lutea Strom.	Oct. 1, 3	2	Oct. 1, 7	2
Cirrhia gilvago Schiff.	Sept. 17	1		
Conistra vaccinii L.			Oct. 13–Nov. 20	5
Dasycampa rubiginea Schiff.	Mar. 14, 31, Apr. 13, 15	6	Apr. 27	1
Eupsilia transversa Hufn.	Oct. 20, Nov. 4, 25 (2)	4	Apr. 17, Sept. 3, Nov. 11, 12	4
Lithiphane socia Hufn.	Apr. 18, Nov. 10	2	Apr. 17, 18, 19	3
Graptolitha ornipotus Hufn.	Mar. 19–May 13, Nov. 10	8	Nov. 6, 11	2
Xylocampa areola Esp.	Mar. 4–May 19	87	Apr. 8–18	4
Cucullia verbasci L.	May 10	1		
C. umbratica L.	June 6–July 19	36		
Pyrrhia umbra Hufn.	June 22	1		
Rivula sericealis Scop.	June 28, July 16 (2)	3	Aug. 11	3
Scoliopteryx libatrix L.	May 13, Aug. 8, 10	3		
Polychrisia moneta Fab.	July 12–Aug. 8	12		
Plusia chrysitis L.	June 7–Sept. 30	430	June 23–Sept. 1	13
P. bractea Schiff.	July 21	1		
P. festucae L.	Aug. 30. 31, Sept. 1, 2	5		
P. jota L.	June 22–Aug. 2	120	June 29, Aug. 14	3
P. pulchrina Haw.	June 6–July 19	173	June 19–July 22	11

	SHIPHAM		CHEDDAR	
	Dates	Total numbers	Dates	Total numbers
P. gamma L.	June 9–Nov. 14 (3)	431	July 9–Nov. 12	10
Abrostola triplasia L.	June 28	1		
A. tripartita Hufn.	May 13–Sept. 17	112	June 16–Aug. 13	6
Catocala nupta L.	Aug. 31–Sept. 24	6	Sept. 13	1
Lygephila pastinum Treit.	July 10, 12, 15, 25, 29	5	July 22	1
Zanclognatha tarsipennalis Treit.	July 12, 16, 19, 21	4		
Z. grisealis Schiff.	June 24–July 29	5	June 19–July 24	20
Laspeyria flexula Schiff.	July 16–29	7		
Hypena proboscidalis L.	June 28–Sept. 26	54	July 13–Sept. 3	17
GEOMETRIDAE				
Pseudoterpna pruinata Hufn.	July 16, Aug. 8	2	July 24, Aug. 1 (2)	3
Geometra papilionaria L.	July 12, 19 (3)	4	July 9–26	8
Comibaena pustulata Hufn.			July 1, 7, 14	3
Hemithea aestivaria Hb.	July 6–Aug. 2	49	July 13, 14	2
Sterrha aversata L.	June 22–Aug. 19	107	June 23–Aug. 13	47
S. biselata Hufn.	July 23–Aug. 10	13	July 20–Aug. 11	27
S. dimidiata Hufn.	July 12, 16, 21	3		
Cosymbia linearia Hb.	July 23	1		
C. annulata Schulze			June 6–Sept. 3	11
C. albipunctata Hufn.	Aug. 10	1		
Ortholitha mucronata Scop.	May 12–June 15	15	June 19	1
O. umbrifera Prout	July 12	1	July 5	1
O. limitata Scop.	July 27–Sept. 8	19	Aug. 9, 11, 13	3
O. bipunctaria Schiff.			July 13–Sept. 6	20
Larentia clavaria Haw.	Sept. 16, 17 18	3		
Acasis viretata Hb.			Aug. 9, 15 (2)	3
Triphosa dubitata L.			Aug. 17–Oct. 7	6
Ecliptopera silaceata Schiff.	Apr. 29–Sept. 1	13	Apr. 17–Sept. 3	33
Lygris prunata L.	July 16, Aug. 2, 10	3		
L. pyraliata Schiff.	*c.* Aug. 1–Aug. 10	6	Aug. 13	1
Cidaria fulvata Forst.	June 28, 30 (4), July 6	8		
Dysstroma truncata Hufn.	June 8–Oct. 21, Dec. 1	172	June 6–Oct. 13	245
D. citrata L.	July 31–Sept. 1	6	July 24–Sept. 3	76
Lyncometra ocellata L.	June 6–Sept. 14	54	June 19–Sept. 6	11
Chloroclysta miata L.	Oct. 6	1	Oct. 13	1
Thera obeliscata Hb.	June 14 (2), Sept. 8–Oct. 21	8		
Xanthorhoe ferrugata Cl.	May 9–Sept. 1	14	Sept. 3	1
X. spadicearia Schiff.	Apr. 18–Sept. 1	202	Apr. 30 (2), July 24–Aug. 17	9
X. designata Hufn.	Sept. 10	1		
X. montanata Schiff.	May 14–July 21	104	June 6–29	32
X. fluctuata L.	Apr. 19–Sept. 29	40	July 5–Sept. 3	4
Epirrhoe galiata Schiff.	Aug. 14	1	Aug. 9	1
E. alternata Mull.	May 12–Sept. 15	71	June 6–Aug. 17	19
Colostygia olivata Schiff.			Aug. 15–Sept. 3	16
C. pectinataria Knoch	May 26–Sept. 29	117	June 6–Sept. 13	15
C. multistrigaria Haw.	Mar. 15–Apr. 28	7	Apr. 14–27	9
C. didymata L.	July 23	1		
Euphyia rubidata Schiff.			Sept. 13	1

	SHIPHAM		CHEDDAR	
	Dates	Total numbers	Dates	Total numbers
E. bilineata L.	June 22, Aug. 18, Sept. 12	3	July 14–20	3
Melanthia procellata Schiff.			June 19–Aug. 15	15
Earophila badiata Schiff.	Mar. 19, Apr. 13–May 1	26	Apr. 17, 18	4
Coenotephria derivata Schiff.	Apr. 17	1		
Perizoma affinitata Steph.	June 7–Aug. 18	42		
P. flavofasciata Thunb.	May 12–July 29	22		
P. albulata Schiff.	May 11–July 12	33		
Hydriomena furcata Thunb.	July 15–Aug. 10	26	July 17–Sept. 9	522
Asthena albulata Hufn.	June 9, 20, 24	4		
Hydrelia flammeolaria Hufn.			July 30	1
Discoloxia blomeri Curt.			June 6–Aug. 13	39
Operophtera brumata L.	Jan. 13–15, Nov. 21–Dec. 14	30	Nov. 29–Dec. 25	180
Oporina dilutata Schiff. (or *christyi* Prout)	Oct. 12–Nov. 30	31	Oct. 8–Dec. 3	71
Eupithecia pulchellata Steph.	June 14–July 16	6		
E. expallidata Doubld.			Aug. 9–13	6
E. succenturiata L.	June 30, July 4, 16 (2), 27, 29	6		
E. icterata Vill.	July 19–Aug. 19	13		
E. haworthiata Doubld.	Aug. 2	1		
Chloroclystis coronata Hb.	Aug. 4	2	July 30–Aug. 11	4
C. rectangulata L.	Apr. 17–July 21	13	June 6–July 26	5
Horisme vitalbata Schiff.			Aug. 9, 15, 17	3
H. tersata Schiff.			June 21–July 20	9
Orthonama lignata Hb.	Sept. 3	1		
Abraxas sylvata Scop.			June 19–Aug. 11	56
A. grossulariata L.	July 16–Sept. 16	56	Aug. 3–17	6
Ligdia adustata Schiff.	May 12–Aug. 10	25	June 6–July 13	8
Bapta bimaculata Fab.			June 6	1
B. temerata Schiff.	May 14–Aug. 2	17	June 16–July 13	11
Cabera pusaria L.	June 15–July 16	15	June 6–July 24	34
Plagodis dolabraria L.	June 7–28	21	June 6–23	13
Campaea margaritata L.	June 28–July 29	17	June 21–July 24	69
Ennomos quercinaria Hufn.	Aug. 18–Sept. 22	5	Aug. 9–Oct. 7	35
Deuteronomos alniaria L.	Aug. 10–Oct. 11	13		
D. fuscantaria Haw.	Aug. 14–Oct. 9	21	Oct. 1	1
D. erosaria Schiff.	Sept. 1–18	8	Sept. 3, Oct. 7	2
Selenia bilunaria Esp.	Mar. 23–May 14, July 15–Sept. 3	202	Apr. 14–30, July 14–Aug. 17	84
S. tetralunaria Hufn.	May 12, July 27–Aug. 2	7	July 17–Aug. 11	35
Apeira syringaria L.	July 10	2		
Gonodontis bidentata Cl.	May 12–June 17	23	Apr. 30–May 19	16
Colotois pennaria L.	Oct. 9–Nov. 25	30	Oct. 13–Dec. 3	77
Crocallis elinguaria L.	July 10–Aug. 19	76	July 5–Aug. 17	26
Ourapteryx sambucaria L.	July 6–29	56	July 9–26	12
Opisthograptis luteolata L.	Apr. 30–Oct. 8	265	Apr. 30–Oct. 7	113
Epione repandaria Hufn.	Oct. 11, 13	2		
Semiothisa liturata Cl.	July 12	1		
Itama wauaria L.	June 28–Aug. 2	9		
Chiasmia clathrata L.	Aug. 10	1		
Theria rubicapraria Schiff.	Jan. 30–Mar. 24	56		
Erranis leucophaearia Schiff.	Feb. 10, 25, 27	3		

	SHIPHAM		CHEDDAR	
	Dates	Total numbers	Dates	Total numbers
E. aurantiaria Hb.	Dec. 1–14	8	Nov. 29–Dec. 23	45
E. marginaria Fab.	Feb. 7–Apr. 13	13		
E. defoliaria Cl.	Jan. 13, 28, Oct. 16–Dec. 15	38	Oct. 8–Dec. 23	148
Alsophila aescularia Schiff.	Feb. 18–Apr. 30	45		
Phigalia pederia Fab.	Jan. 12–Mar. 3	14	Dec. 16, 23	2
Lycia hirtaria Cl.	Apr. 17–May 12	19	Apr. 15–May 10	78
Biston strataria Hufn.	Feb. 4–Apr. 26	25	Apr. 8, 14, 15	4
B. betularia L.	May 14–Aug. 14	108	June 16–Aug. 11	41
Hemerophila abruptaria Thunb.	May 11–17	7		
Alcis repandata L.	June 15–July 27	60	June 19–Sept. 3	1,330
Gnophos obscurata Schiff.			Sept. 3	1
Ematurga atomaria L.	July 15	1		
COSSIDAE				
Zeuzera pyrina L.	July 19	1		
HEPIALIDAE				
Hepialus humuli L.	June 12–July 12	10		
H. sylvina L.			Aug. 15	1
H. fusconebulosa Deg.	June 22	1	June 26	1
H. lupulina L.	June 13, 22, 24	4	June 19, 23	2
PYRALIDAE				
Aphomia sociella L.			July 7	1
Eurhodope advenella Zinck.			Aug. 15	1
Myelois cribrumella Hubn.			July 26, Aug. 9	2
Hypsopygia costalis Fab.	June 14–Sept. 9	28	July 30	1
Mesographe forficalis L.	May 26–Sept. 24	36	June 6, 21, July 7	3
Sylepta ruralis Scop.	July 16–Sept. 11	56	July 17–Sept. 3	35
Perinephela lancealis Schiff.			June 21–July 17	7
Eurrhypara hortulata L.	June 7–July 29	95		
Pyrausta nivealis Fab.	July 10–31	10	July 17–Aug. 15	46
P. lutealis Hubn.	July 19–31	36		
P. martialis Guen.	July 2, Oct. 21	2	July 9	1
P. olivalis Schiff.	June 15–July 15	35	June 21–July 14	32
P. asinalis Hubn.			July 22, Aug. 1	2
P. coronata Hufn.	July 25 (2), 29	3		
P. purpuralis L.	July 16–Aug. 19	9		
P. nigrata Scop.	July 29	2		
P. cespitalis Schiff.	July 21	1		

Appendix

Critical species recorded but not included in Systematic List:

SHIPHAM	CHEDDAR
Pheosia tremula Cl.	
Apetele spp.	*Apetele* spp.
Procus spp. (some only)	*Procus* spp. (some only)
Caradrina alsines Brahm.	*C. alsines* Brahm.
C. blanda Schiff.	*C. blanda* Schiff.
C. morpheus Hufn.	
Anaitis spp.	*Anaitis* spp.

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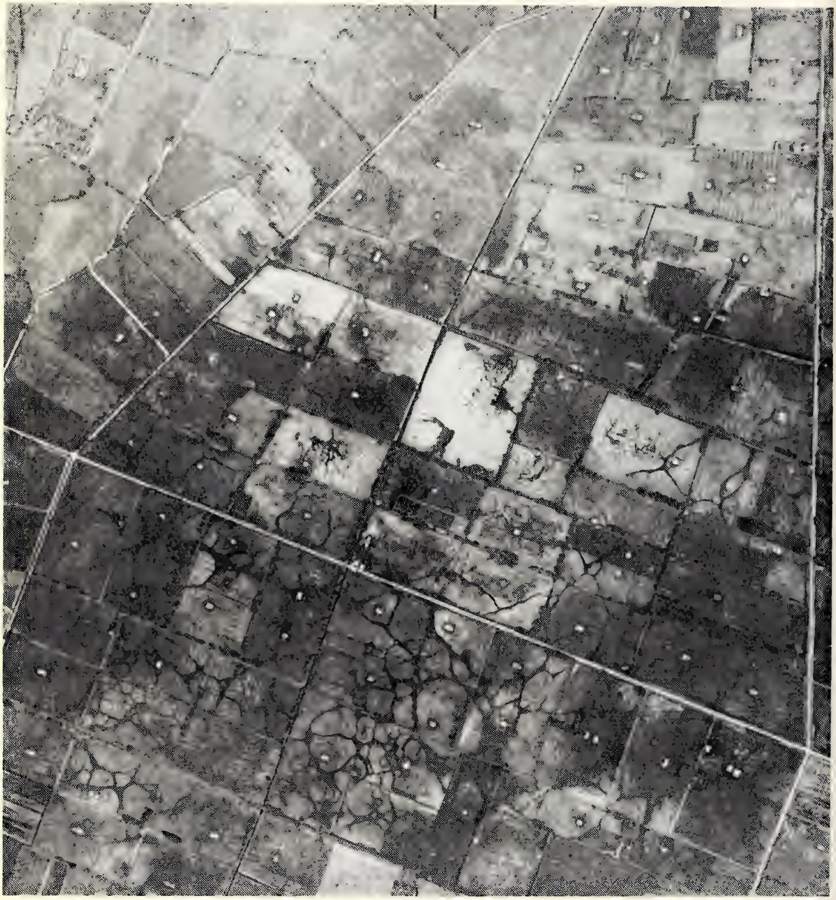

Vertical air photograph, Godney Moor.
Ministry of Defence (Air Force Department) photograph, Crown Copyright Reserved.

Brook Farm can be seen (lower centre) adjoining Western Drove which crosses the print diagonally (see Fig. 1).

SURFACE PATTERNS ON GODNEY MOOR, SOMERSET

By L. F. Curtis

(Department of Geography, University of Bristol)

VERTICAL air photographs taken in 1947 reveal an extensive area of surface patterns occurring on Godney Moor situated approximately three miles north-east of Glastonbury. The patterns consist of polygonal and sub-circular networks and can be readily identified as dark-toned lines on air photographs (Plate IX). On the ground the patterns can be observed as winding and sometimes discontinuous channels separated by peat rises. Godwin (1958) refers to air photographs of the region displaying a remarkable 'shark-skin' patterning south of the Panborough Gap.

The patterns occur upon soils of the Godney Series which have been mapped where peat or organo-mineral deposits overlie the estuarine clay of Romano-British age (Findlay, 1965). When appreciable variations in thickness of horizons occur within a series, subdivisions referred to as soil phases may be distinguished e.g. deep phase, shallow phase. Two soil phases have been recognized in the Godney Series. The deep phase which occupies the central part of Godney Moor consists of soils where peat exceeds 2 ft. in thickness. It has been noted by Findlay (*op. cit.*) that the deep phase forming the highest part of Godney Moor is not now subject to flooding. In contrast the shallow phase of the Godney Series, consisting of shallow organo-mineral deposits (usually between 12 and 24 in. thick), occurs at lower elevations where the water level is usually within 18 inches of the surface and where winter flooding is common. Organic matter contents of the shallow phase soils are variable and the surface horizons may consist of peaty clay containing less than 40% organic matter.

THE DISTRIBUTION AND SUB-SURFACE CHARACTERISTICS OF THE PATTERNS

It may be noted that the patterns are largely confined to deep phase soils of the Godney Series although they also extend in the form of faint markings into the margins of shallow phase soils at the northern boundary of Godney Moor. The patterns appear to be absent from the areas of shallow phase Godney Series lying to the south, and also from nearby soils of the Midelney Series which have been mapped where flood deposits overlie the peat thus forming a distinct clay or peaty clay surface layer. A boring made 100 yards south of Brook Farm (G.R. ST/477444) provided the following section in deep phase Godney Series within the patterned area.

cm.	Brook Farm + 25.1 ft. O.D.
0–81	Black–dark brown fibrous peat
81–518	Blue-grey silty clay (Romano-British clay)
518–731.5	Brown amorphous peat with reddish wood fragments
731.5 +	Grey silty clay.

A boring by Godwin (1958) in the Drake's Drove area to the west of the patterned area may be summarized as follows:

cm.	Drake's Drove + 22.7 ft. O.D.
0–85	Brown–yellow brown fibrous peat
85–128	Grey detritus mud
128–463	Blue clay
463–605	Detritus mud
605–638	Black peat
638 +	Grey clay.

Comparison of the borings indicates that there is good accordance in the level of the surface of the lower clay whilst the Romano-British clay assumes different heights at these locations.

At least three scales of pattern may be distinguished. Pattern A (Plate IX) occurs on higher sections of the moor and comprises polygons of approximately 24 ft. diameter. Pattern B consists of polygonal and sub-circular outlines with diameters of about 90 ft. Pattern C is formed by large scale polygons with diameters ranging up to 500 ft. A detailed survey of the large scale polygons has been carried out in order to determine whether the sub-peat surface is channelled. Air photo enlargements at a scale of about 18 inches to the mile were employed to locate selected datum points radiating from the centres towards the bounding channels of the polygons. The ground surface height of each point was established by Watts Level and Sopwith Staff from a Bench Mark. The depth of peat to the sub-peat clay surface was determined by auger borings. Peat depth and the height above O.D. of the clay surface at each of the datum points (see Fig. 1) are given in Table 1.

Inspection of the data indicates: (i) a gradual fall in height of the clay surface towards the west from approximately 27 ft. O.D. to approximately 18 ft. O.D.; (ii) in 5 polygons occurring in fields A and B the clay surface was found to be higher in the channels than at the centres of the polygons; (iii) the height difference of the clay beneath polygon centre and channel decreases westward from 2 ft. 7 in. to approximately 6 inches. The westernmost polygons (field C) appear to show small height differences related to the general fall to the west rather than to the polygonal pattern. The gradual fall in clay height to the west indicates greater variation in the height of the sub-peat surface than suggested by Godwin (1958) —'The level of the top of the Romano-British clay here [Drake's Drove] is + 18.5 ft. O.D. which is much the same as along North Chine Drove, but a little less than the clay surface under Berrow Hill close to the Panborough gap'.

DISCUSSION

In general form these patterns resemble the polygonal, net, and circular features associated with patterned ground occurring in periglacial environments (Washburn, 1956). However the pattern is located on Romano-British clay and overlying peat deposits, neither of which were exposed to periglacial conditions. Older deposits of presumed Boreal and Late Glacial age lie buried at a depth of some twenty feet. Thus the patterning cannot be ascribed directly to periglacial action. No evidence is at present available to indicate the processes whereby underlying periglacial patterns, if present, have been imprinted upon the overlying clay and peat formations. Apart from the undulations of the clay surface already noted, the Romano-British clay appears to be uniform in character and consists of silty clay, only one boring indicating textural change to sandy clay.

Borehole data indicate that the pattern is formed in peat. Clay was not observed at the surface at any of the datum points. This suggests that the structural composition of the peat may be the primary factor responsible for the pattern, as is often the case in organic terrain. However Radforth (1963) points out that many patterns are secondarily imposed by extra-biotic factors after peat formation has become established. Such factors may include ice, the nature of the sub-peat mineral layer, and changes in water conditions. The drainage of Godney Moor has produced fundamental changes in the water conditions affecting the peat. Surface water which formerly occupied marginal depressions around elevations in the peat surface has been drained into boundary ditches. Such drainage may have facilitated erosion of the peat in the channels with resultant deepening and linking up of certain pre-existing depressions. Under these circumstances pressure release along the eroded channels might permit some upward adjustment of the clay surface and the development of undulations of the type described.

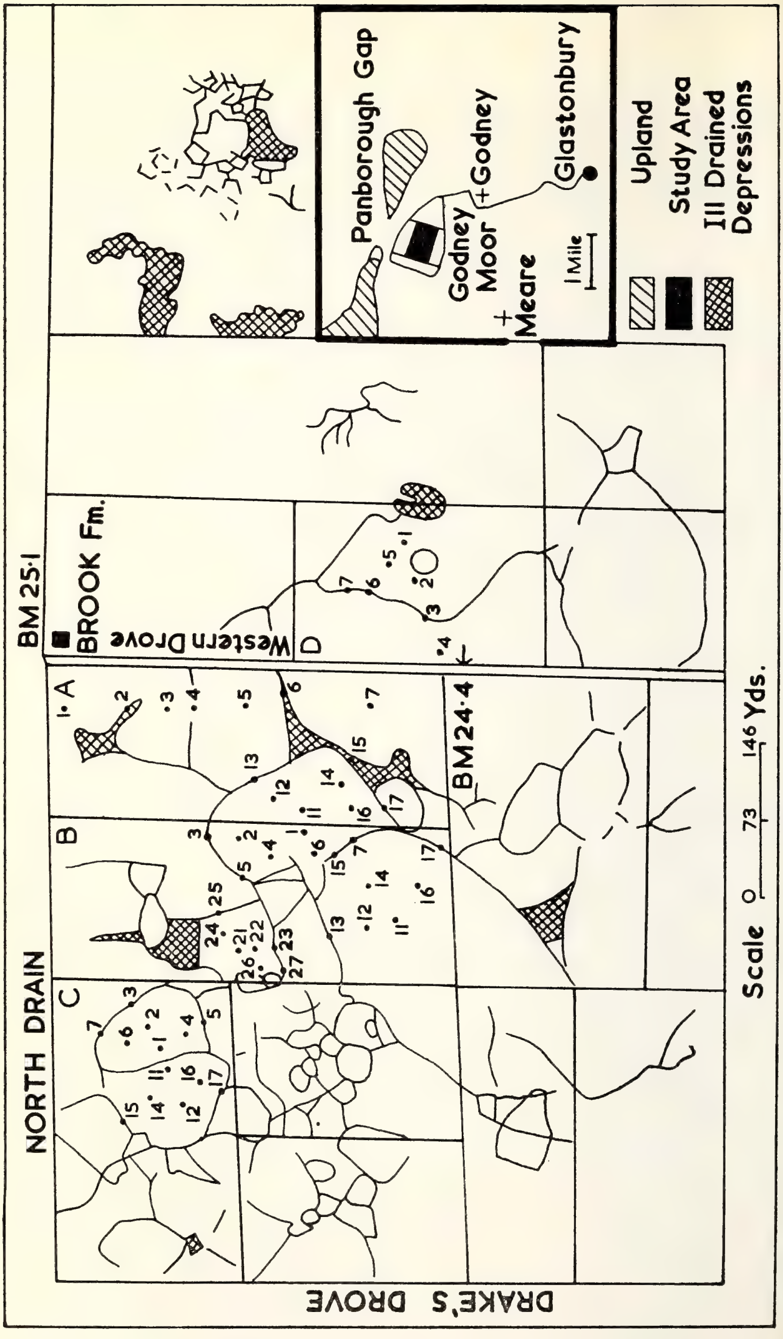
NORTH DRAIN
DRAKE'S DROVE
Western Drove
BM 25·1
BROOK Fm.
BM 24·4
A
B
C
D
Scale 0 73 146 Yds.
Panborough Gap
Godney Moor
Godney
Meare
Glastonbury
1 Mile
Upland
Study Area
Ill Drained Depressions

Fig. 1. *Borehole positions and surface patterns, Godney Moor, Somerset.* Table 1 gives data for fields A, B, C and D.

The patterns and undulations appear to be accentuated in those higher parts of Godney Moor which are not now subject to flooding and where the water level is lower. This fact may indicate that surface desiccation has influenced the development of the patterning.

Table 1. Borehole data, Godney Moor

Field No.	Depth of peat ft.	Depth of peat in.	Height above O.D. of sub-peat clay surface ft.	Height above O.D. of sub-peat clay surface in.	Field No.	Depth of peat ft.	Depth of peat in.	Height above O.D. of sub-peat clay surface ft.	Height above O.D. of sub-peat clay surface in.
A1	2	4	23	10	C1	5	0	18	7
A2	–	7	26	11	C2	4	3	19	3
A3	3	4	24	4	C3	1	2	19	9
A4	1	0	27	1	C4	4	7	18	3
A5	3	3	24	9	C5	1	2	19	7
A6	1	6	26	1	C6	5	0	18	4
A7	4	1	24	1	C7	1	2	18	9
A11	4	7	21	1	C11	5	3	19	8
A12	4	5	21	2	C12	5	1	18	8
A13	3	1	21	10	C13	3	7	18	1
A14	4	10	21	5	C14	5	6	18	11
A15	2	8	22	4	C15	2	10	18	11
A16	4	1	21	4	C16	4	8	19	5
A17	2	0	21	10	C17	2	3	19	7
B1	4	8	21	0	B11	5	1	19	4
B2	3	11	21	6	B12	5	1	19	9
B3	3	3	21	8	B13	3	9	19	5
B4	4	0	21	5	B14	5	10	19	6
B5	2	6	21	9	B15	3	10	19	9
B6	4	5	21	0	B16	3	9	21	0
B7	2	6	21	4	B17	1	1	21	7
B21	3	11	20	9	D1	4	3	23	1
B22	4	0	20	7	D2	4	6	22	8
B23	1	10	20	1	D3	2	4	24	11
B24	4	5	21	0	D4	3	5	23	0
B25	1	9	21	10	D5	3	9	23	6
B26	4	6	19	9	D6	3	2	23	2
B27	1	0	20	6	D7	2	10	23	8

ACKNOWLEDGMENTS

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THE GEOLOGY OF THE PORTBURY AREA

By A. B. Hawkins

During the 1960's sixty-six boreholes were drilled by the Port of Bristol Authority as part of the site investigations for two proposed dock schemes. In 1964 plans were completed for the large Portbury Dock, but were rejected in 1966 and a smaller scheme prepared, now known as the West Dock Scheme. Thirty-three boreholes were involved in each of the site investigations; the position of these is shown in Fig. 1. The main purpose of this paper is to describe the geology revealed by a study of the borehole data of the area.

THE SITE AND PRESENT DAY RELIEF

Whilst much of the land forming the coastal lowlands west of the River Avon is between +20 and +25 ft. O.D., there are two higher areas; north of Sheepway the land rises to +46 ft. O.D. and in the Sheephouse Farm area to +56 ft. O.D. In the proposed Portbury Scheme the main dock was to have been constructed in the lowland between these two areas of higher land, the wharf construction benefiting from the solid rock near the surface to the west; this site has now been proposed for a potential extension of the West Dock Scheme. The West Dock site is north of the Sheephouse Farm rise, an area of low marshy ground known as St. George's Wharf.

One of the essential features of any modern port is the entrance lock, so positioned that it is as free of silting as possible and with maximum accessibility for the tidal range. The positioning of the lock was studied at the Hydraulics Research Laboratories at Wallingford and the final decision is that shown in Fig. 1. Fortunately the River Severn is kept fairly deep and silt-free in this area (cf. Fig. 2) by the natural scour on the concave bank and the high tidal current velocity—up to six knots at ebb and flood spring tides.

SUB-ALLUVIAL RELIEF

The sixty-six boreholes recorded in the area since 1963, with those of previous site investigations, have given a reasonable indication of the nature of the rock surface and its height relative to Ordnance Datum. The heights at each borehole are recorded in Fig. 2 and an attempt has been made to show the relief of the rock surface by indicating contours of the alluvial/rock boundary at ten feet intervals.

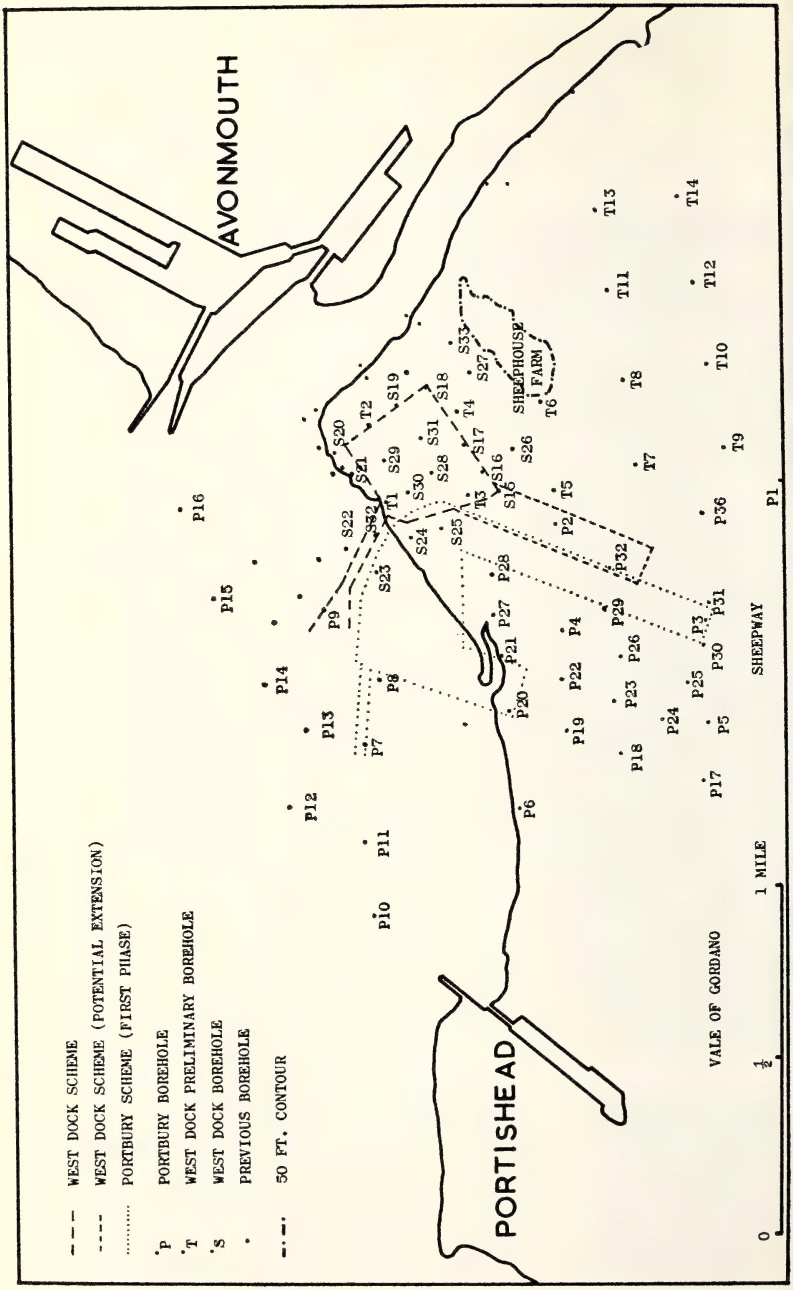
— — — WEST DOCK SCHEME
- - - - WEST DOCK SCHEME (POTENTIAL EXTENSION)
.... PORTBURY SCHEME (FIRST PHASE)
·P PORTBURY BOREHOLE
·T WEST DOCK PRELIMINARY BOREHOLE
·S WEST DOCK BOREHOLE
· PREVIOUS BOREHOLE
-·-· 50 FT. CONTOUR
AVONMOUTH
PORTISHEAD
SHEEPHOUSE FARM
SHEEPWAY
VALE OF GORDANO
0
½
1 MILE
P1
P2
P3
P4
P5
P6
P7
P8
P9
P10
P11
P12
P13
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Fig. 1. *The position of the boreholes and proposed Dock Schemes.*

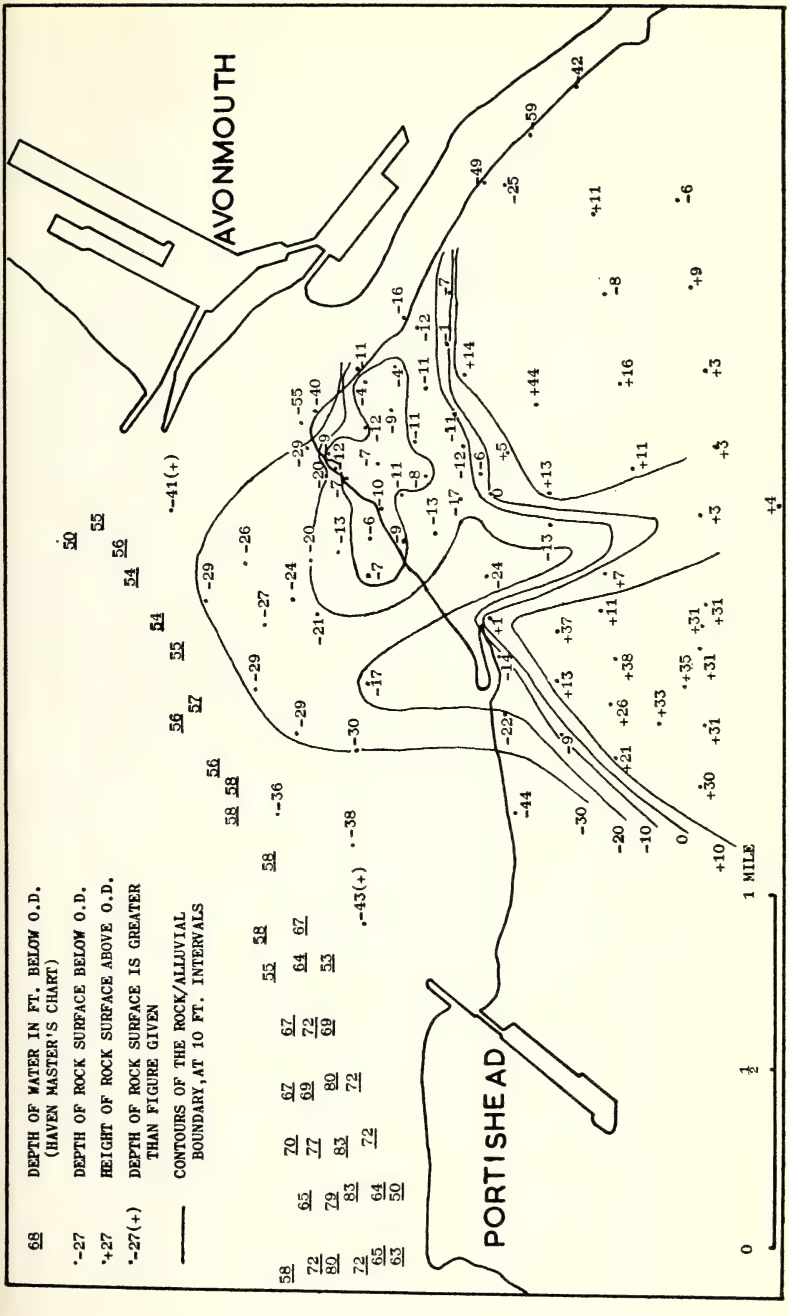
68 DEPTH OF WATER IN FT. BELOW O.D. (HAVEN MASTER'S CHART)
•-27 DEPTH OF ROCK SURFACE BELOW O.D.
•+27 HEIGHT OF ROCK SURFACE ABOVE O.D.
•-27(+) DEPTH OF ROCK SURFACE IS GREATER THAN FIGURE GIVEN
CONTOURS OF THE ROCK/ALLUVIAL BOUNDARY, AT 10 FT. INTERVALS
AVONMOUTH
PORTISHEAD
-30
-20
-10
0
+10
0
½
1 MILE

Fig. 2. *The height of the rock/alluvial boundary.*

An inlier of Trias causes the rise of the land at Sheephouse Farm. The top of this feature, covered by a thin terrace veneer between +50 ft. and +55 ft. O.D., is quite flat and was probably formed as an old erosion surface. Between this area and the Sheepway rise there is a S.S.E.–N.N.W. buried valley (Fig. 2). West of this valley the rock surface rises quite steeply to above +30 ft. O.D. where, partly covered by superficial deposits, it forms the Sheepway rise. It seems improbable on the available evidence, including fieldwork and the M5 site investigations, that there is any major valley separating the Sheepway rise and the Failand Ridge area to the south. West of the Sheepway spur the sub-alluvial relief drops away to below —40 ft. O.D. at the northern end of the Vale of Gordano, as indicated here by P6 penetrating to —44 ft. O.D. before reaching the Trias.

The recent boreholes for the West Dock Scheme indicate a slight rise in the sub-alluvial surface north of the Sheephouse Farm inlier. Here the rock surface rises to —4 ft. O.D. and eleven boreholes record a rock height of between —4 and —10 ft. O.D. suggesting a rise with an east-west trend as shown in Fig. 2. There is a very slight depression between this rise and the higher land of the Sheephouse Farm area to the south. To the north-east the contours on the rock surface show a steep drop away to the mouth of the River Avon; to the north-west it slopes gently away as shown by the —10 and —20 ft. contours running well out into the present Severn Channel, indicating a gently shelving area north of the Sheepway spur which is about half a mile wide. This platform was probably formed by marine erosion and correlates well with the feature under Caldicot Level, to be described in the near future, and is probably Weichselian in age.

THE TRIAS

Although dominantly covered by superficial deposits, terrace gravels, head and river alluvium, the whole area discussed here is underlain by rocks of Triassic age. The Keuper Marl has been seen in temporary exposures in the Sheephouse Farm inlier and is visible on the northern side of the Sheepway rise. Most of the sixty-six boreholes, generally drilled to about —40 ft. O.D., are recorded as ending in marl, but occasionally in mudstone, sandstone and in the case of T13 and T14 in fourteen and ten feet of conglomerate respectively. Whether these boreholes have penetrated the Dolomitic Conglomerate or were stopped within a conglomeratic band in the Keuper is not known. Some thin conglomeratic bands, often with limestone pebbles, are recorded in boreholes T8-14. From their position they probably indicate periods of occasional flash flooding when the limestone fragments were transported from the hill mass to the south. Immediately south of the village of Portbury, however, the Keuper Marl is replaced by the Dolomitic Conglomerate, the latter forming the usual veneer around the limestone hills, in this case the Failand Ridge.

THE GRAVELS

The site investigations have shown three main heights at which gravel occurs (Fig. 3). The highest, above +30 ft. O.D., has been mapped by the Institute of Geological Sciences as their No. 1 Terrace. In the second, the gravel forms a covering to the marl on the site of the proposed West Dock Scheme and the third relates to the gravels in the sub-surface valley between the Sheepway and Sheephouse Farm rises.

The highest gravels, recorded in some of the Portbury boreholes, are much better known because they are exposed at the surface. The base of the gravels is nowhere clearly exposed but field evidence, supported by the boreholes, suggests a height of about +30 ft. O.D. The gravels are exposed at the northern end of the Sheepway rise (ST 494772) and are also observed in many of the fields nearby and on top of the Sheephouse Farm rise. They are seen to contain sandstones (quartzitic—probably Millstone Grit age, Old Red Sandstone and Pennant), quartz pebbles, conglomerate and rare Carboniferous Limestone fragments. Pebbles of Liassic limestone, oolitic limestone as well as chert and flint are abundant, especially in the northern exposure. There were also several lumps of the Jurassic coral *Isastrea* and one Cretaceous echinoid, *Holaster laevis*, the pressence of which, with the flint and chert, suggests that much of the gravel has been transported here via the Bristol Avon valley.

Gravel deposits of similar height occur over a wide area to the south-west of Chepstow (Bristol Geological Sheet) where they are recorded as the No. 2 Terrace, i.e. equivalent to the Kidderminster Terrace and therefore Eemian in age. ApSimon and Donovan (1956) have recorded gravel between +36 and +46 ft. O.D. to the south-west in the Vale of Gordano and suggest that these deposits are in part marine in nature and were aggraded during the Last Interglacial (Eemian in age). The base of the gravels in the Portbury area is in fact higher than that of the No. 1 Terrace at Woolaston (Chepstow Geological Sheet) where Wills (1938) records his Main Terrace "with its base resting on Keuper Marl at the level of the present alluvium or even a few feet below it" and suggests a base of about +20 ft. O.D. Therefore on altimetric evidence the gravels at Sheepway and Sheephouse Farm appear equivalent to the No. 2

Severn Terrace and so Eemian in age rather than to the No. 1 Terrace as indicated on the Geological Maps.

Fig. 3 shows that the majority of the gravels recorded rest on a surface at about —10 ft. O.D. With the exception of T9-12, the boreholes all lie in the area of the proposed West Dock Scheme and rest on the small rise in the sub-alluvial relief previously recorded. The material recovered in boring varied in size between fine sand to small cobbles.

The gravels found in the sub-surface valley and recorded in P1 and P36 rest on marl at +3 ft. and +4 ft. respectively. No gravel is recorded in P2 and here peat occupies the bed of the valley. Thus these gravels are probably locally derived from the Failand Ridge to the south.

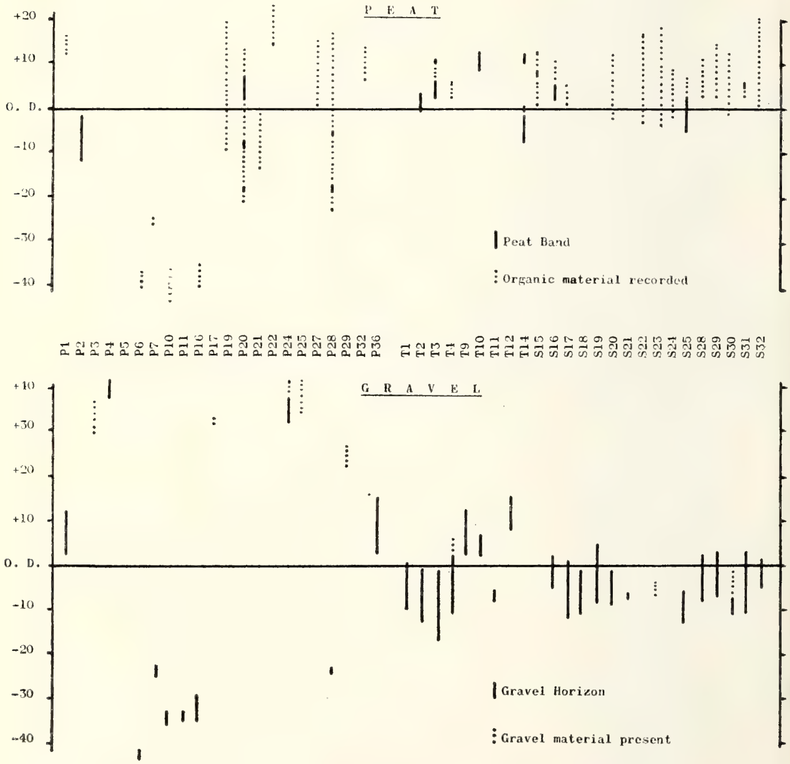

Fig. 3. *The height of peat and gravel deposits recorded in the boreholes.*

THE PEAT

The recording of organic matter in the silts and other deposits and of distinct peat bands is shown in Fig. 3. It is immediately apparent that here there are no distinct peat horizons that can be traced over a wide area. Instead the evidence suggests that the conditions during the formation were similar to those of today with, apart from the Vale of Gordano, isolated pockets of peat accumulation, rather than a large area as in the Somerset Levels. As no detailed examination has yet been made of the peat it is inappropriate here to discuss its origin further.

The peat band recorded in boreholes P20 and P28 at about —18 ft.O.D. may be compared with that recorded by Godwin (1940) at Swansea between —23 and —18 ft. O.D. and dated by him as pollen zone VIc. It can also be compared with peats between —18 and —13 ft. O.D. at Avonmouth zoned by Seddon (1965) as VIIa and with the peat at Burnham at —15 ft. O.D. dated by Godwin and Willis (1959) as 6,262 ± 130 B.P. (Before Present), and thus indicating that it formed towards the end of the Boreal transgression. Peat is further recorded from several boreholes (Fig. 3) between —10.5 and —1 ft. O.D. which in altitude is below the top of the marine clay in the Somerset Levels (Godwin, 1943) and therefore again formed during the late stage of the marine transgression, which ended about 5,400 B.P. (Godwin and Willis, 1961).

Several peat bands lying between 0 and +13 ft. O.D. are probably comparable to the widespread peat horizons of the Somerset Levels and under Caldicot Level; details of the latter are to be published later. Godwin and Willis (1964) have dated the top of the peat in the Caldicot Level where it is overlain by marine clays as 2,660 ± 110 B.P., showing a period of relative sea level stability for the preceding three thousand years. This was followed by the Romano-British marine transgression which deposited clays on the lands bordering the Bristol Channel and penetrated the Gordano Valley to a substantial extent, reaching Weston Drove, and resulting in more than 10 ft. of marine clay in some parts (Jefferies, Willis and Yemm, 1968).

Peats are now recorded in several small areas to the south between +20 and +22 ft. O.D. (Geological Map). In the Vale of Gordano—further inland—Willis and Jefferies (1959) have described the accumulation of peat to heights of between +16 and +18 ft. O.D. and have recently discussed the Late and Post Glacial history of the area (Jefferies, Willis and Yemm, 1968).

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SOME FULLER'S EARTH SECTIONS IN THE SOUTH COTSWOLDS

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INTRODUCTION

THE Fuller's Earth (BATHONIAN) of the South Cotwolds is poorly known since natural exposures are rare. Arkell and Donovan (1952) have described the stratigraphy in this area but recent excavations for the Bristol Motorway (M4) have shown that the stratigraphy is more complex than was thought.

A. THE FULLER'S EARTH OF THE BRISTOL MOTORWAY

An important section in the Fuller's Earth has recently been exposed near Dodington Ash, north of Bath (ST/757782) during excavations for the new M4 (Bristol–London) motorway. The main section in the Fuller's Earth was exposed immediately to the west of the Bath–Stroud road (A46) intersection with the M4. The following section was seen in the Fuller's Earth. The Institute of Geological Sciences are preparing for publication an account of the complete section here.

	GREAT OOLITE LIMESTONE	Extends above
	UPPER FULLER'S EARTH CLAY	
Bed		*Thickness*
20.	Marls and occasional thin limestones, the top of one of the latter showing a pronounced bored oyster-covered surface—seen at the intersection with A46	c. 30 ft.
19.	TRESHAM ROCK: Pink unfossiliferous well-bedded compact limestones with strongly iron-stained marl band towards base	c. 15 ft.
18.	Brown bedded marls and clays	15 ft.
	ORNITHELLA BEDS (Beds 11–17)	
17.	Brown streaky clay with fauna of large *Ornithella bathonica* (Rollier) *bathiensis* Muir-Wood	3 ft.
16.	Brown streaky clay	2 ft.
15.	Blue clay with fossil wood and *Ornithella bathonica in situ* at base	7 ft.
14.	Brown, impersistent shelly marl	3 in.
13.	Thin limestone band; *Procerites* sp. *in situ*	6 in.
12.	Very fossiliferous shelly marl. Main horizon for *Ornithella bathonica*	1 ft. 6 in.
11.	Rubbly limestone	c. 1 ft.
10.	DODINGTON ASH ROCK: Compact, thick-bedded pink to yellow detrital limestones	6 ft.–8 ft.
9.	Greenish clays with white marlstone near top	2 ft.

8.	Blue clay with whiter fossiliferous limestone in centre with *Liostrea acuminata* (J. Sowerby)	5 ft.
7.	CROSS HANDS ROCK: Very rubbly detrital limestone full of comminuted shell fragments and crinoid ossicles with sharp lithological lower boundary, but gradational at top. *Meleagrinella echinata* (W. Smith) very common at base	2 ft. 6 in.
ACUMINATA BEDS (Beds 3–6)		
6.	Thin cream fine-grained limestone with *L. acuminata*	3–6 in.
5.	Cream coloured marls	9 in.–1 ft.
4.	Blue clays	4 ft.
3.	Blue *L. acuminata* lumachelle—very fossiliferous	3 ft.
LOWER FULLER'S EARTH CLAY (Beds 1 and 2)		
2.	Blue and green clays	25 ft.
1.	Knorri clay at base with *Catinula knorri* (Voltz) *lotharingica* de Grossouvre	
INFERIOR OOLITE		

The following faunas were collected:

ORNITHELLA BEDS (11–17)

Bed 17: *Ornithella bathonica bathiensis,* 31730–72, abundant. 15 specimens collected loose from this horizon had a mean length of 36.3 mm. with a standard deviation of 4.06 and a standard error of 1.04. *Serpula* sp. (small quadrate species) very common; *Liostrea acuminata,* 31773–5, occasional.

Bed 15: the basal portion yielded frequent *Ornithella bathonica.*

Bed 13: *Procerites* sp., 31781, *in situ* in the middle of the bed.

Bed 12: *Ornithella bathonica* extremely abundant, 31782–824, 31828–56. 42 specimens collected *in situ* had a mean length of 24.2 mm. with a standard deviation of 4.06 and a standard error of 0.62. *Procerites* sp., 31825–7, *Hibolites parallelus* (Phillips), 31827, 31860–2, *Rhynchonelloidella smithi* (T. Davidson) (common), 31857–9, *Liostrea acuminata* (occasional), 31865–6, *Wattonithyris* sp. (occasional), *Pholadomya* sp., *Oxytoma* sp.

DODINGTON ASH ROCK. Bed 10: *Lycetticeras comma* (S. S. Buckman), Bristol City Mus. Cb 4602, a fine large, almost complete specimen, with 1¼ whorls of body chamber, and the following dimensions (in mm.):

		Whorl height	Whorl width	Umbilical width
At maximum diameter	108	56.5(0.52)	56.0(0.51)	18.5(0.17)
At diameter	90	54.0(0.60)	56.5(0.63)	9.5(0.105)

Ceratomya sp. (one), *Ctenostreon rugosum* (W. Smith) (one), 31875, *Ornithella* cf. *haydonensis* Muir-Wood, 31870–3, *Wattonithyris* sp. (several); all these found loose on the outcrop of the bed, in the characteristic matrix. *Tulites* sp. indet., 31868, *in situ* in lower half of the bed (3–4 ft. above the base).

Bed 8: *Liostrea acuminata* (frequent), 31879–86, *Chlamys* (*Radulopecten*) sp., *Pecten* sp. indet. (fragments), *Pentacrinus* sp. (ossicles—frequent), minute regular echinoid, micromorphic gastropod; all identified from a sample collected above the middle of the bed. Parts of Bed 8 were very fossiliferous in places being almost entirely composed of shell fragments.

CROSS HANDS ROCK. Bed 7: *Tulites* sp. (GSM LAJ 217) collected loose by officers of the Institute of Geological Sciences on or near the outcrop of the bed. It can have come only from Bed 7 to judge by lithology. *Meleagrinella echinata*, both left and right valves, extremely abundant in the basal part of the bed, 31906–37, 31942–6. Other fossils collected *in situ* from the base of Bed 7 include: *Pholadomya lirata* (J. Sow.), 31902, *Pleuromya* sp., *Parallelodon* sp., Terebratulid pedicle valve, rare specimens of *Liostrea acuminata*, 31938–41.

ACUMINATA BEDS (3–6)

Bed 6: quite fossiliferous: *Liostrea acuminata* (frequent), 31947–61, *Ceratomya* sp., *Pholadomya lirata*, 31963, *Anisocardia* sp., *Wattonithyris* sp., ammonite impression (Oppelid); all collected *in situ*.

A large *Procerites* sp. found loose, 31970, and heavily encrusted with large *Serpulae* possibly came from this bed, as well as a further septate fragment of another *Procerites* sp., 31971.

Bed 4: rather unfossiliferous but a sample collected about 1 ft. 6 in. from the top yielded several fragments of *Liostrea acuminata*, 31972–3.

Bed 3: the main *Liostrea acuminata* bearing lumachelle, being a solid bank almost entirely composed of masses of this oyster. Brachiopods were also frequent. The following were collected *in situ*: *Procerites* sp. indet., 31974, Perisphinctid ammonite (?*Wagnericeras*), 31975, *Liostrea acuminata* (extremely abundant), 31976–8,33000–52, *Wattonithyris* sp. (abundant), *Kallirhynchia* sp. (referable to the forms figured by Muir-Wood (1936) from the Lower Fuller's Earth Clay—abundant), *Rhynchonelloidella* sp. (rare), *Acrosalenia* sp. (single fine specimen).

The Institute of Geological Sciences collections also contain 2 ammonites (both *Procerites* sp.) from this bed (GSM LAJ 45–46).

Specific names for the well preserved brachiopod fauna of this bed cannot be accurately given until the brachiopods of the Lower Fuller's Earth are restudied and the various morphotypes figured by Muir-Wood (1936) are re-evaluated.

A large *Procerites* sp. (part of the body-chamber) preserved in a blue mudstone was also found on the outcrop of the Acuminata Beds, 33103–4 (Beds 3–6).

The junction of Beds 2 and 3 marks the base of the Acuminata Beds. *Liostrea acuminata*, it must be noted, ranges higher than the Acuminata Beds having been recorded in Beds 7, 8, 12 and even 17 above. Beds 3–6 undoubtedly mark the acme of this species at this section, although it is still very common in Bed 8. It is more strictly localized stratigraphically in the region south of Bath. Farther north and into the Cotswolds its vertical range becomes more extensive, although it is still most common at the same horizon as in the Bath district.

Bed 1: crowded with the small oyster *Catinula knorri lotharingica*, 33105–218, which is so characteristic of the same horizon in the area between Doulting and Bath, Somerset, where ammonites of the Zigzag Zone have been found in association.

PREVIOUS WORK IN THE AREA

The Fuller's Earth of the region has been described by several authors. Reynolds and Vaughan (1902) described beds in the Sodbury railway tunnel to the north. Part at least of their "Passage Beds", in which they found *Procerites*, are clearly equivalent to the Tresham Rock of the motorway section, as already noted by Arkell and Donovan (1952). From other parts of the Fuller's Earth below the Passage Beds they recorded *Ornithella* and *Meleagrinella echinata*, forms which occur commonly in particular beds in the motorway section.

A section to the south of Sodbury Tunnel and only a little to the north of the motorway section is that recorded by Fry at Dodington Ash (1951). This section is not easy to correlate with that of the motorway. Fry's Bed 15, however, obviously correlates with Beds 12–15 of the motorway, both yielding small *Ornithella*, while his Bed 13 with *Meleagrinella echinata* must include Bed 7 of the motorway. His Bed 12 is equivalent to the Acuminata Beds. There are, however, discrepancies in thicknesses of various beds between the two sections.

Richardson (1935) has described a detailed section at the Cross Hands Road cutting (ST/764811) which lies between the motorway section described here and the Sodbury Tunnel. Correlation between the two sections is quite good. At the base of the sections, the Ostrea Acuminata Clay described by Richardson in the Lower Fuller's Earth is identical both in thickness and fossil content to Bed 3 of the motorway. It was this bed at the Cross Hands Road cutting which yielded *in situ* the *Wagnericeras fortecostatum* (de Grossouvre)—Bristol University Museum 13494, recorded by Arkell (1951–59, p. 205) in error from the Cross Hands Rock above. Richardson's next bed above is Bed 4 of the motorway. The two basal beds placed by Richardson in his Fuller's Earth Rock are presumed equivalent to Beds 5 and 6 of the motorway, but Richardson's placing of them in the Fuller's Earth Rock must have been due to the presumed occurrence of "Ornithellids" in them. The collection from this locality has been redetermined (in Arkell and Donovan, 1952) and the Ornithellids shown wrongly determined. Above these beds Richardson records a bed up to 1 ft. thick in which *Meleagrinella echinata* was fairly common. This is obviously equivalent in part to Bed 7 (Cross Hands Rock) of the motorway section. Richardson's second Ostrea Acuminata Clay in his "Upper Fuller's Earth" above correlates with some part of Bed 8 of the motorway section in parts of which *L. acuminata* is still very common.

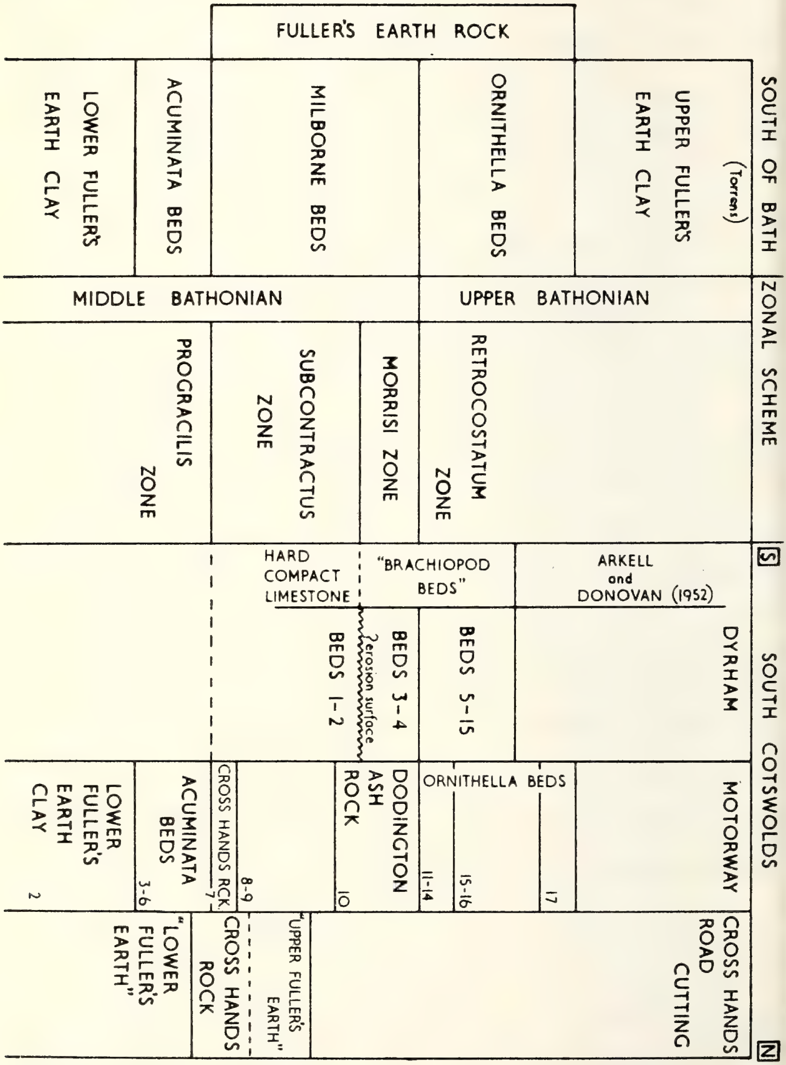
Bed 8 of the motorway section is entirely Subcontractus Zone, *Tulites* having been found both above and below. It is a clay band of variable thickness interdigitated between limestone beds (Beds 10 and 7). The lower of these limestone units, Bed 7 at the motorway, has been named the Cross Hands Rock by Arkell and Donovan (1952), the type section being at Cross Hands Road cutting where according to Richardson's description it was 9 ft. thick (four beds of limestone separated by clay). Of these, Richardson's lowest two may be better classed with the Acuminata Beds, to judge by the motorway section and the absence of *Ornithella* in them. The lower part of the Cross Hands Rock in both places is crowded with *M. echinata*, forming a useful marker horizon; the Cross Hands Rock of the type section is equivalent to Bed 7 and a part of Bed 8 of the motorway section. This rock unit is entirely of Subcontractus Zone age.

Beds equivalent to Bed 10 of the motorway section were thus not included with the Cross Hands Rock at the type section, not having been exposed there. Bed 10 is thus so far unnamed. The name Dodington Ash Rock has been chosen and the type locality is that of the motorway section (Bed 10). The Institute of Geological Sciences have used the term Fuller's Earth Rock for this unit, but since both the Cross Hands Rock and the Dodington Ash Rock (with several of the beds above) are to be correlated with the true Fuller's Earth Rock of Bath, this cannot be followed (see Fig. 1).

CORRELATION OF THE MOTORWAY SECTION ORNITHELLA BEDS

Beds 17 to 12 yielded *Ornithella bathonica* sspp. and are to be correlated with the Ornithella Beds of the Fuller's Earth Rock south of Bath. The Ornithellid faunas of Somerset show a slight but progressive increase in size but the topmost beds of the Somerset Ornithella Beds no longer contain Ornithellids.

The top bed (17) of the Ornithella Beds at the motorway, however, yielded Ornithellids larger in size than any collected south of Bath. They can only be compared with the largest "species" figured by Muir-Wood (1936)—*O. brutonensis* (Rollier) and *O. bathonica* var. *bathiensis*. The name *O. bathonica bathiensis* has been given to the



	SOUTH OF BATH (Torrens)	ZONAL SCHEME		S SOUTH COTSWOLDS: ARKELL and DONOVAN (1952)	DYRHAM	MOTORWAY	CROSS HANDS ROAD CUTTING N
	UPPER FULLER'S EARTH CLAY	UPPER BATHONIAN	RETROCOSTATUM ZONE				
FULLER'S EARTH ROCK	ORNITHELLA BEDS			"BRACHIOPOD BEDS"	BEDS 5–15	ORNITHELLA BEDS 17 15-16 11-14	
	MILBORNE BEDS	MIDDLE BATHONIAN	MORRISI ZONE		BEDS 3–4	DODINGTON ASH ROCK 10	
			SUBCONTRACTUS ZONE	HARD COMPACT LIMESTONE	?erosion surface BEDS 1–2	8-9	"UPPER FULLER'S EARTH"
						CROSS HANDS RCK. 7	CROSS HANDS ROCK
	ACUMINATA BEDS		PROGRACILIS ZONE			ACUMINATA BEDS 3-6	"LOWER FULLER'S EARTH"
	LOWER FULLER'S EARTH CLAY					LOWER FULLER'S EARTH CLAY 2	

Fig. 1. *Correlation table, Fuller's Earth Rock and Clays, south of Bath and in the South Cotswolds.*

population from Bed 17 which is correlated with the top of the Ornithella Beds south of Bath.

Beds 12 to 15 (basal part) yielded smaller Ornithellids referred to *O. bathonica.* In length and overall size, the population is shorter and smaller than that of Bed 17, the mean length being 33% less. Beds 12–15 correlate on ammonite evidence with the basal part of the Ornithella Beds of Somerset. The Ornithellids from Beds 12–15 are, however, somewhat smaller in length and size than those at the base of the Ornithella Beds in Somerset. Probably the two populations are of identical age and the slight size differences due to control by differences in environment.

The Ornithella Beds of Somerset and the Bristol Motorway section belong in the Retrocostatum Zone (Torrens, 1967). It is known from other ammonite evidence (Torrens, in press) that all beds from the Ornithella Beds up to and including the Tresham Rock belong in the same Zone.

MORRISI ZONE

From the evidence south of Bath (Torrens, 1965, 1967) the upper part of the Dodington Ash Rock on which the loose specimen of *Lycetticeras* was collected is to be placed in the Morrisi Zone. The small specimens of *Wattonithyris* sp. found loose may have come from the same horizon to judge by the distribution of this genus in the Fuller's Earth Rock of Somerset.

SUBCONTRACTUS ZONE

The two specimens of *Tulites* found at the motorway section show that all beds from the lower half of the Dodington Ash Rock, in which a specimen was found *in situ,* down to and including the Cross Hands Rock belong in the Subcontractus Zone. The four small *Ornithella* cf. *haydonensis* Muir-Wood collected loose from Bed 10 must have come from the Subcontractus Zone portion of the Bed, as in Somerset where this species is restricted to this Zone.

PROGRACILIS ZONE

The Acuminata Beds of the motorway yielded several specimens of the Perisphinctid genus *Procerites* and the same horizon at the Cross Hands Road cutting (p. 432) a specimen of *Wagnericeras fortecostatum.* The ammonites are the same as those found in the Acuminata Beds south of Bath. They show that the Acuminata Beds belong in the Progracilis Zone (Torrens, 1967).

B. FULLER'S EARTH ROCK OF DYRHAM

A further Fuller's Earth section in this area is that exposed near Dyrham in the head of the Combe, south of Dyrham (ST/744744). This was first noted by Richardson (1910) and a generalized section has been recorded by Arkell and Donovan (1952).

The Fuller's Earth Rock section here has never been recorded in detail, and is as follows:

Soil
FULLER'S EARTH ROCK (Beds 1–15)

Bed		*Thickness*
15.	Bioclastic limestone	seen
14.	Marl	6 in.
13.	Bioclastic limestone	3–6 in.
12.	Marl	6 in.
11.	Fractured rubbly bioclastic limestone	1 ft.
10.	Strata obscured	c. 4 ft.
9.	Marl } *Ornithella*	seen 6 in.
8.	Very rubbly bioclastic limestone } *bathonica* (abundant)	1 ft.
7.	Marl	1 ft. 6 in.–2 ft.
6.	Bioclastic limestone	1 ft.
5.	Marl	1 ft.
	Morrisi Zone (Beds 3 and 4)	
4.	Nodular limestone	2 ft.
3.	Marl	1 ft. 3 in.
	Subcontractus Zone (Beds 1 and 2)	
2.	Chalky limestone (top of Arkell and Donovan's Hard compact limestone?, 1952)	1 ft. 6 in.
1.	Chalky limestone	2 ft. seen

Beds 2–5 may be slightly cambered and their thicknesses slightly overestimated as a result.

The only faunas collected *in situ* here were:

Bed 11: *Ornithella* sp. (occasional).

Beds 9 and 8: *Ornithella bathonica* (very common), 33356–467, 33484–99; 49 complete specimens had a mean length of 24.3 mm. with a standard deviation of 3.45 and a standard error of 0.49. These results compare closely with those calculated by McKerrow (1953) from another population collected here (Dyrham south). They are identical in size to the population from Bed 12 of the motorway section and allow a definite correlation to be made. *Rhynchonelloidella* sp. (occasional), *Liostrea acuminata* (occasional specimens), 33470–1, 33481.

Bed 5: *Liostrea acuminata*, 33511.

Bed 4: *Pleuromya subelongata* (d'Orbigny), 33512.

Bed 3: an erosion surface may be present at the base of Bed 3 since an adherent oyster was seen cemented to the top surface of Bed 2 and a bored oyster-covered limestone pebble found in Bed 3 (33517).

Bed 2: *Tulites* sp., Bristol City Mus. Cb. 4603, (*in situ*). This part of the section belongs in the Subcontractus Zone and is to be correlated with the lower part of the Dodington Ash Rock of the motorway section which has also yielded *Tulites*.

Palaeontological correlation between the motorway and Dyrham sections is possible, but correlation between lithological divisions at the two sections is almost impossible. There seems to be rapid and considerable variation in the development of limestones in these beds in this region.

The Dyrham Fuller's Earth Rock correlates on brachiopod and ammonite evidence with the middle of the three rock bands and the superjacent Ornithella beds in the Fuller's Earth at the motorway section (the Dodington Ash Rock of this paper—see Fig. 1). Arkell and Donovan (1952) correlated this Dyrham section with the Tresham Rock they recognized farther north, but the motorway section has shown that this correlation needs modification. The Fuller's Earth Rock at Dyrham is at a separate horizon below the Tresham Rock. There seems little doubt that Arkell and Donovan could only map the Cross Hands Rock and Dodington Ash Rock together as one unit which they called the Cross Hands Rock, the lower of their two rock units in the Fuller's Earth. These new sections have shown that three rock units are present and not two as originally thought. The new correlations outlined above are shown diagrammatically in Fig. 1.

SUMMARY

A new section exposed during construction of the M4 motorway has shown for the first time the succession in the Fuller's Earth of the South Cotswolds. Three limestones are present, not two as thought previously. These are in descending order:

Tresham Rock (of Upper Bathonian age).
Dodington Ash Rock—newly named (of Middle Bathonian age—Morrisi and Subcontractus Zones).
Cross Hands Rock (of Middle Bathonian Age—basal Subcontractus Zone).

The celebrated exposure of Fuller's Earth Rock at Dyrham is correlated with the motorway section and shown to be of similar age to the Dodington Ash Rock. It is not to be correlated with the Tresham Rock as had been suggested.

A number of ammonites have been found, normally very rare in these strata.

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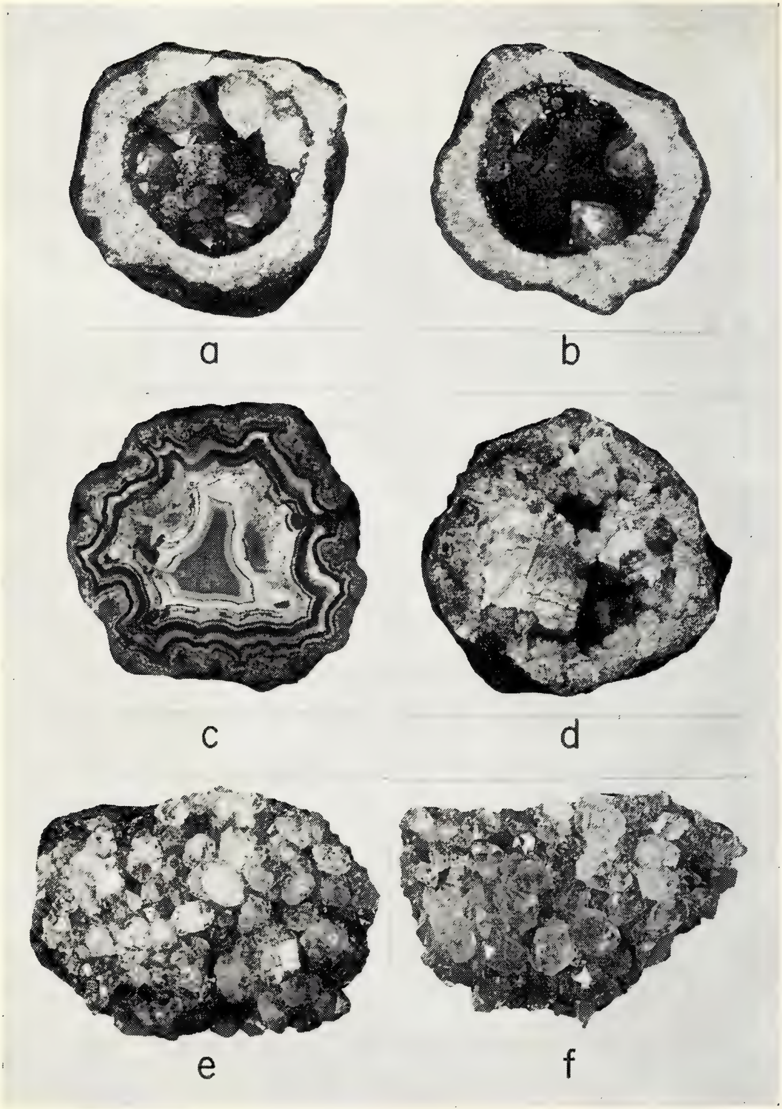

a–d: Potato Stones; a and b: Two halves of one stone with a rim of fine-grained quartz with larger quartzes (Bristol Diamonds) growing into the cavity; c: Stone completely filled with agate and fine-grained quartz; d: Rim of fine-grained quartz with central cavity being filled by large calcite crystal (flat area to left of centre); e, f: Quartz (Bristol Diamonds) growing from the sides of veins. All × 0·6.

(*Photographs by R. Godwin*)

BRISTOL DIAMONDS

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INTRODUCTION

> Thus when two gems their emulous light display,
> That in a true, this in a glist'ring ray,
> Vulgar spectators with distracted eyes
> Gaze; or the more highly the false jewel prize,
> Till, to a skilful lapidary shown
> He parts the diamond from the Bristol stone.

THIS extract is from the poem *Divination* by Wase in 1666 which is, according to Lord, one of the few political satires of the time to support the government of the period. In it the author is discussing the ethics of anonymous attacks on the administration and is perhaps suggesting the difference between true and false friends. It is clear that he realizes that Bristol Stones are often passed off as diamonds—that they are, in fact, counterfeit.

It is the purpose of this article to enquire into the nature of Bristol Diamonds or Bristol Stones, to show how early observers believed them to be true diamonds albeit of inferior quality, and to trace the growing awareness of the fact that they are quartz crystals. The distribution of the stones in the Bristol district is described, and their possible mode of origin discussed. Finally, a number of quotations are given to show how Bristol Diamonds were well known to late sixteenth and seventeenth century poets.

The two substances which are confused are diamond and quartz. Diamond, a form of carbon, is the hardest substance known, is often colourless and transparent but may show pale colours such as yellow or green; sometimes it is black. It is often found as rounded and shapeless pebbles but may occur as small octahedral crystals; the variety of faces found on jewellery-diamonds have been cut by lapidaries (Fig. 1, a–c). Diamond is highly-prized as a gem-stone because of its hardness, brilliance, 'fire' and rarity.

Quartz, one of the many forms of silica, may be colourless and brilliant but is often milky, smoky, amethystine or rose-coloured. When found as small, well-formed crystals (Fig. 1, e, f) it has a superficial resemblance to some forms of cut diamond. It was much used in second-rate jewellery, being cut as 'brilliants' (Fig. 1, c), but is much softer than diamond, has no 'fire' and is very abundant.

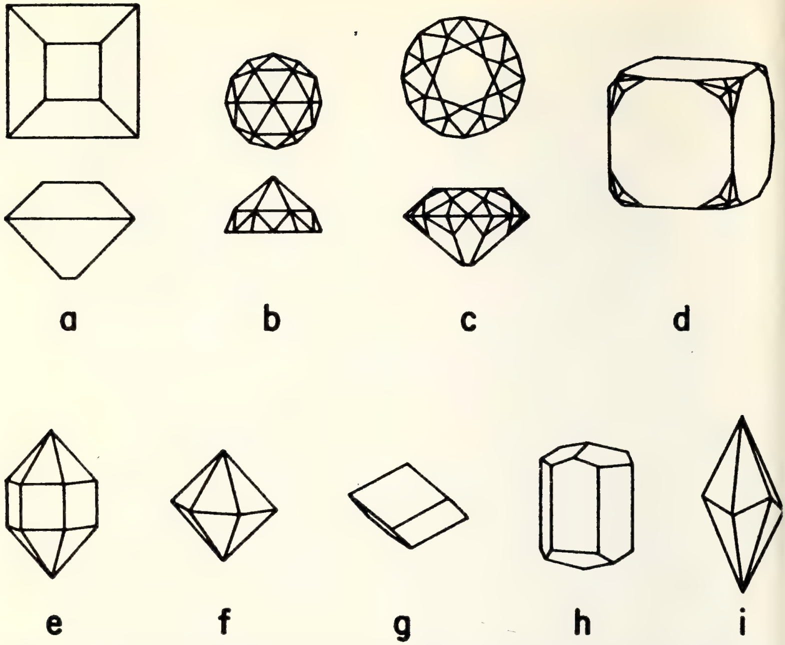

Fig. 1. a–c: Top and side views of cut diamonds:— a: Table; b: Dutch rose; c: Brilliant. d: Fluorite cube modified by hexoctahedron; e: Common form of quartz showing prism capped by two sets of rhombohedra; f: Quartz with only the rhombohedra developed and thus resembling hexagonal bipyramids. g–i: Forms of calcite:— g: Rhombohedron; h: Prism capped by rhombohedron (nail-head spar); i: Scalenohedron (dog-tooth spar).

QUARTZ

In several of the following quotations the word 'c(h)rystal' is used instead of quartz and it is appropriate to discuss briefly the origin of the name quartz. More extended discussion can be found in the articles by Frondel (1962) and Tomkeieff (1942).

Theophrastus in the third century B.C. used the word *cristallos*, and Pliny in the first century A.D. *crystallus*, for rock-crystal (i.e. quartz), which was believed to have been formed from water by extreme cold, it being said that rock-crystal was found only where the snows of winter were frozen hard. This belief was commonly held until the seventeenth century.

The term *crystal* was applied to the transparent, euhedral type of quartz until the eighteenth century but afterwards to any body with a regular polyhedral form. At about the same time the name *quartz* came into more general use for the form of silica occurring as good crystals. It had been widely applied to the white, granular, massive type of vein quartz since the beginning of the eighteenth century though in sporadic use much earlier. The first usage of the word quartz in English by Jorden (1632) also mentions Bristol Stones:

> There are also certain stones which we call fluores [fluorite], which doe naturally shoot in divers forms: as Christall six squares Sparr, which the Dutch [Germans] call Sput or Quertz, shoots into points like diamonds: as we see in those Cornish or Bristoll stones.

EARLY REFERENCES TO BRISTOL DIAMONDS

William Camden's *Britannia* (1586) is a mine of information on the history, geography and folklore of the various counties. Bristol is described in the chapter on Somersetshire and Holland's translation (1610, p. 239) of the original Latin edition gives . . .

> From hence as *Avon* holdeth on his course, there are on ech side very high cliffes by nature set there (as it were) of purpose, the one of them which on the East-side overlooketh the river beareth the name of *S. Vincents rock*, so full of Diamants, that a man may fill whole strikes or bushels of them. These are not so much set by, because they be so plenteous. For in bright and transparent colour they match the Indian Diamants, if they passe them not: in hardnesse onely they are inferior to them; but in that nature her selfe hath framed them pointed with six cornered or foure cornered smooth sides; I think them therefore worthy to be had in greater admiration. The other rocke also on the West-side is likewise full of Diamants, which by the wonderfull skill and worke of nature, are enclosed as young ones within the bowels of hollow and reddish flints: for, heere is the earth of a red colour.

Since no other mineral is mentioned it seems certain that Camden believes these crystals to be diamonds though he agrees that they are of inferior hardness. The forms he describes are those of quartz and since they have naturally-occurring smooth bright faces they are superior to Indian diamonds which must be cut. Camden infers that the diamonds on the western (Leigh Woods) side of the river have a different mode of occurrence from those at St. Vincent's Rock. The 'hollow and reddish flints' may well be potato stones about which more is said later.

The diarist John Evelyn visited Bristol in 1654 but it is not clear whether or not he believed the stones to be true diamonds . . .

> but what was most stupendious to me, was the rock of St. *Vincent* . . . the precipice whereoff is equal to any thing of that nature I have seene in the most confragose cataracts of the *Alpes* . . . Here we went searching for *Diamonds* . . .

Thomas Fuller (1662, **3**, p. 33) in a section on the 'Naturall Commodities' of Bristol, seems to be in no doubt.

> These are the *Stars of the Earth*, though such but *dimme ones*, which St. *Vincents Rock* near to this City doth produce. Their Price is abated by their *paleness* and *softnesse*, to which we may add their *Number* and *Nearness;* For, were they but few and far fetched, their *value* would be advanced; They are not those *Unions*, *Pearles* so called, because thrifty Nature only affordeth them *one* by *one;* seeing that not only *Twins* but *Bunches* and *Clusters* of these are found together.
>
> Were this Rock of raw Diamonds removed into the *East-Indies*, and placed where the Beams of the Sun might sufficiently concoct them, probably in some hundreds

> of years they would be ripened into an *Orient* perfection. All I will add is this; a Lady in the reign of Queen *Elizabeth* would have as patiently digested the *Lye*, as the wearing of False Stones or Pendants of counterfeit Pearl, so common in our Age; and I could wish it were the worst piece of hypocrisy in *Fashion*.

Britannia became a standard reference and many later writers such as Childrey (1661) owed much of their information to it. In a chapter on 'Natural Rarities of Somersetshire' he writes (p. 37) . . .

> On the upper side of these craggy Rocks of St. *Vincent*, are digged out pellucid stones, sexangular (or six cornered) which we call *Diamonds*. Some will have them to be Chrystal, but (saith Mr. Johnson) I think they are rather of the nature of *Fluores*. For (saith he) I remember an Apothecary of *Bristol* told me, the Lord of the place would not have them taken out of the Iron Mine, (which was the womb in which they were formed) because the greater quantity of them make the Metal the more fluid, and apt to melt. And *Agricola* tells us, that *Fluores* are very like *Diamonds* but not so hard, and that they are used in the melting and trying of Metals; for (saith he) they make the matter in the fire much more fluid. And *Kentmannus* in his Catalogue of *Fossils*, reckons *Pellucid Fluores*, sexangular, and like Crystal. Of these St. *Vincent Stones*, Cambden speaks thus: They are (saith he) so plentiful there, that one may fill a bushel with them; and they are all either four cornered or six cornered. And saith *Speed*, saving their hardness, they are as good as the *Diamonds* of *India*.
>
> On another Rock more Western than St. *Vincents* Rock, there are found *Diamonds* enclosed in hollow and reddish Flints after a wonderful manner, and the Earth itself is red there too.

Childrey clearly believes that the pellucid stones are not diamonds and the fluores he mentions is fluorite (Fig. 1, d) which is now only rarely found in the Bristol district.

John Strachey, who has an important place in the history of geology, proposed writing a *Somersetshire Illustrated* but only the *Proposals* were printed. Recently Webby (see Strachey, 1736) cited a section of Strachey's manuscript entitled *Of Stones* and the following is a brief extract (Webby, 1967, p. 317).

> Neither are we altogather destitute of precious Stones. In the Rock Opposite to Saint Vincents in long Aston some few Rubies have been found, Diamonds Equal in lusture [to] the Oriental. Only in hardness they fall short and its Remarkable that on this Side [of] the River they are found Hexagonal in Clusters in flynts of a round fine Reddish Colour and hollow within. On the other Side Mostly Single but Angularaly. These all go Under the Name of Bristol Stones and were it Not for the Commoness would have greater Esteem. Agats and Chrystalls are Many times found among the Rocks of Sparr in Mendip Hills and indeed seem to be Only Sparr improved.

The rubies are hematite-stained quartz crystals and since he talks about agates and crystals in the Mendips it appears that he considers the Bristol Stones to be diamonds but of inferior quality. This is confirmed by a later reference in a passage '*Of Metalls*' (Webby, 1967, p. 321).

> Sparr is also the bed or Seat of Christalls and Bristol Diamonds are found in such Veins of Sparr Inclosed in limestones Rocks. So wee are told the Diamond Mines of Quotara in East India are in a yellowish Earth full of Small pibbles like our gravel pits. Those of Malabar lye in More Reddish or rather Orange Colour Earth

> . . . to which the Surface of the Earth on St. Vincents Rock by Bristol is Orange colour but gradually Changes to yellow.

The suggestion that crystal is only a superior sort of spar (calcite, see Fig. 1, g–i) had been made earlier by Merrett (1678) who considered Bristol Diamonds to be the same as Cornish Diamonds and "seem . . . to be but a finer, purer, and harder sort of Sparr."

Calcite is much softer than quartz, is rarely clear and transparent in the Bristol district, has a quite different crystalline form (Fig. 1, g–i), and a perfect rhombohedral cleavage (similar to Fig. 1, g). However quartz from the Bristol area has been recorded and figured by Phillips (1819) as crystallizing as a 'primitive rhomboid' similar in shape to the calcite rhombs. These two minerals often occur together and have the same mode of occurrence in veins and cavities.

This fact was recognized by Owen (1754) who noted that two sorts of materials—crystals and spar—are often identified as the same. Both can be clear and transparent, are joined to stone at one end and are pointed or sharp at the other, and both grow in clusters, but whereas crystal is clear, bright and hard, spar is muddy, softer and less glassy; crystal will cut glass and suffers no change in a moderate fire, yet spar will break when it touches glass and will calcine to lime when heated; crystal is almost always uncoloured, spar is often yellowish or whitish. He states (p. 32-3) that 'Bristol stones are all of the former kind [i.e. crystal]' and are 'as well polished as if from the hands of a lapidary.' At Clifton 'they resemble table diamonds; and some of them, where the pyramids stand upright, and are broad and short, have at first view an aspect of rose diamonds.' (See Fig. 1, a, b). Owen's observations were extremely acute and the reader is referred to Chapters 2, 3 and 5 for details of the varied crystalline forms of crystal (quartz), of the 'manner in which Bristol stones grow,' of their frequent association with cavities in the iron ores, and with cracks in other rocks. He nowhere mentions 'potato stones' by name but some of the descriptions are clearly of nodules or geodes which have since been called potato stones.

> . . . the old writers supposed, crystal was congealed from water, and I think they say the present writers deny it

but Owen says that he agrees with the old writers. He is not saying that crystal is hard-frozen water but he adduces much evidence from vaults, bridges, kettles, etc., that water can congeal into stone . . .

> or at least that it can leave some stoney matter behind it.
>
> Bristol stones, are formed in the cavities of iron ore and the cracks of stones, just in the same manner as those stoney icicles; that is, from water draining through, and resting a great while upon the surface (p. 54).

This was certainly the best account to that date and there have been few to equal it since. It is therefore all the more surprising to find Barrett (1789) writing . . .

> On St. Augustine's side of the city, a mile down the river Avon, is the noted rock of St. Vincent, which furnishes the naturalist with those beautiful pieces of spar called Bristol stones . . .
>
> . . . in the fissures [of the limestone] are found those fine crystals, smoothed and formed into angles by nature as well as by the most skilful lapidary can be done: sometimes they are found inclosed in hollow reddish nodules, which are as it were pregnant with these gems, and contain them as in a safe matrix, which must be broke before you can discover them; these are turned up often by the plow in the fields near Durdham-down and about Kingsweston.

(See Plate X a, b, for pregnant nodules)

Yet his contemporary Pryce (1778) wrote

> What is vulgarly called Spar with us, and which is so plentifully scattered upon the surface of every heathy common, is not the real Spar; and is, by most Lithologists, better known by the German name of Quartz, for want of a proper English appelative.

DISTRIBUTION AND ORIGIN

By the end of the eighteenth century therefore it had been established that the Bristol Stones were crystal (quartz), that they occurred in fissures in the limestone or in hollow nodules either in the limestone or in closely related rocks and that frequently iron ore was associated. Further, Owen had suggested that the crystal was deposited from circulating waters.

The Bristol area was a popular and important one in the growing study of geology so that there are numerous articles which describe the geology and mention Bristol Diamonds. Reference may be made to Bright (1817), Buckland and Conybeare (1824), Etheridge (1870), Woodward (1876) and Stoddart (1876, 1877).

From these and other accounts it was established that the quartz crystals are associated with iron ore veins and patches, both in the Carboniferous Limestone and the Dolomitic Conglomerate, at Winford, Clifton, Clapton and Providence; they are also found in nodules or geodes, called 'Potstones' or more frequently 'Potato Stones,' in the Dolomitic Conglomerate or closely related Keuper Marls at, for example, Sea Mills, Shirehampton, St. Vincent's Rocks, Westbury-on-Trym, Leigh Woods, Failand, Sandford Hill, East Harptree, Langford, Chilcompton, Dulcote and Wells.

The Dolomitic Conglomerate of Triassic age is a fossil scree deposit banked against Old Red Sandstone and Carboniferous rocks during the wearing away of the mountains produced in this area at the end of Carboniferous times. It varies in lithology from a coarse breccia, as in Bridge Valley Road, Bristol, to a fine-grained yellow dolomitic breccia as at Clevedon. Its flagrantly unconformable relation to the older rocks and its distribution can best be studied on the geological map of the Bristol District. There is always the possibility of finding potato stones and Bristol Diamonds anywhere along this outcrop.

Iron ore (hematite, goethite or limonite) is always found in pipes or fissures in the Dolomitic Conglomerate close to its junction with the underlying Carboniferous Limestone in which veins of iron ore also occur. It seems generally agreed (see Green and Welch, 1965) that the iron was brought into the rocks by groundwaters descending from above, the iron having been leached out of the Trias or, more probably, from shales of the Coal Measures. The calcareous patches in the Conglomerate and parts of the Carboniferous Limestone itself were thus replaced by the iron to produce patches of hematite, etc. These downward percolating waters, moving through fissures and joints, would also carry silica in solution which would be deposited as quartz. Extensive silicification of the Dolomitic Conglomerate has been described from the Mendips by Green and Welch (1965, pp. 74-77 and 95) who however suggest that some of the silica may be of hydrothermal origin, i.e. from ascending waters.

The formation of mineral veins in cracks and crevices in rocks is fairly well understood but the same cannot be said for the formation of geodes (potato stones in the Bristol area). These potato stones (Plate X) are from 1–8 inches across, are sub-spherical to irregular and have outer layers of chalcedonic silica or fine-grained quartz. They are often hollow, with quartz, calcite or celestine crystals growing into them (X, a, b) but they may be completely filled with crystalline materials (X, d) or with banded agate (X, c). The origin of geodes has been discussed in detail by Pettijohn (1949, p. 151) who suggests that the significant features when found in limestones are (1) a subspherical shape, (2) a hollow interior, (3) a clay film between the wall and the limestone matrix, (4) an outer chalcedonic silica layer, (5) an inner drusy lining of inward projecting crystals, (6) evidence of expansion or growth. A necessary prerequisite for geode formation is an initial cavity in which connate (original) saline solutions are present as a fluid isolated from the rest of the rock by a layer of gelatinous silica. The waters outside freshen, osmosis begins and the internal pressure built up is directed against the wall. This promotes solution at the silica-limestone interface which goes on until the concentration of salts inside is reduced and the expansion pressure is negligible. The silica gel dehydrates, crystallizes and then shrinks and cracks so that mineral-bearing waters, as discussed above, can enter the cavity and deposit the quartz, calcite or celestine.

Bristol is not the only place to give its name to these 'false diamonds.' Herbert-Smith (1958) records, in addition, Isle of Wight, Cornish, Vallum (Madras), Mari (Indus), Alaska, Arkansas and Bohemian Diamonds; Miers (1902) has a Wicklow (Ireland) type; Frondel has Herkimer, Lake George, Cape May (all U.S.A.), Marmaros (Hungary), Briancon and Alencon (France), Schaumberg (Germany) varieties and Phillips (1819) mentions Bornholm Diamonds.

BRISTOL DIAMONDS IN LITERATURE

Poets of the late-sixteenth and seventeenth centuries made many allusions to Bristol Diamonds, almost always setting them against real diamonds; there is the idea of the false or counterfeit being contrasted with the true. Even though Strachey in 1736 describes 'diamonds' from the Bristol area and seems to believe them to be real, Lodge (in *Wits Miserie*, 1596) talks about "A counterfeit chain . . . [of] Bristow diamonds." There is a strong possibility that the source of information for many of these early poets was Camden's *Britannia* (1586) in which, as shown earlier, the inferiority of Bristol Diamonds was discussed but which includes no indication that the stones were crystal (later, quartz).

In Hall's *Satires* (1597), which were an arraignment of ostentatious piety in particular and of ostentation in general, we read . . .

> And he that cannot brag of greater store,
> Must make his somewhat much, and little more.
> Nor can good Myson wear on his left hond,
> A signet ring of Bristol diamond,
> But he must cut his glove to show his pride,
> That his trim jewel might be better spy'd: . . .

Drayton's poem *Poly-Olbion* (1612) is said to recreate the romantic spell of Elizabethan England. In the fourth song, lines 188–193, he makes a brief reference to Bristol Diamonds.

> And as Loëgria spares not anything of worth
> That any way might set her goodly Rivers forth,
> As stones by nature cut from the *Cornubian* Strond;
> Her *Dertmore* sends them Pearle; *Rock-vincent*, Diamond:
> So *Cambria*, of her Nymphs especiall care will have.
> For *Conwy* sends them Pearle to make them wondrous brave;

Meercraft, in Ben Jonson's *The Devil is an Ass* (1616), asks Gilthead to find him a diamond ring so that he can play some trick on Fitzdottrel. When this is produced in Act III, Scene 1, Meercraft asks

> Meercraft . . . How now; you have there now
> Some Bristol stone or Cornish counterfeit
> You'd put upon us!
>
> Gilthead No, sir, I assure you:
> Look on his lustre, he will speak himself!
> I'll give you leave to put him in the mill:
> He is no great large stone, but a true paragon,
> He has all his corners, view him well.

In Nathan Field's *Amends for Ladies* (1612) Husband suspects his wife and asks his friend Subtle to discover whether or not she is true to him. This is playing into Subtle's hands since he desires the wife and thus can carry out his friend's wishes while at the same time furthering his own evil designs. In their discussions Husband says (Act I, line 483)

Chimicall metals, and bright gold it selfe
By sight are not distinguisht, but by th' test;
Thought makes good wives, but triall makes them best:
To the unskilfull owners eies alike
The Bristow sparkles as the Diamond,
But by a Lapidarie the truth is found,
Come you shall not denie me.

The widespread use of quartz for diamonds either as cheap jewellery or perhaps with deliberate intent to defraud obviously made people wary and John Cleveland in *The King's Disguise* (1651), a poem which makes reference to the stealing of packets of secret letters, uses the term Bristoll-sense as synonymous with a suspicious nature.

Hence Cabinet-Intruders, Pick-locks hence,
You that dim Jewells with your Bristoll-sense:
And Characters, like witches, so torment,
Till they confesse a guilt, though innocent.

Mennis and Smith (1658) return to the problem of the real and the false, the true and the good friend, in their poem *To the Duke of Buckingham.*

Oh you that should in choosing of your owne,
Know a true Diamond from a Bristow stone,
You that do know they are not allwayes best
In their intent, that lowdest do portest
But that a prayer from the Convocation
Is better than the Commons protestation,
Trust them that at your feet their lives will lay
And know no arts but to performe and pray
Whilst they that buy perferment without praying
Begin with bribes, and finish with betraying.

and the poem by Wase quoted earlier is on the same theme.

Between 1673 and 1678 Samuel Butler wrote *Hudibras* and in the next few years a number of imitations of it appeared. In one of these, by Ward, (1707, vol. II) we find:

The cap the stalking hero wore
Was set with Bristowe gems before.

The Rev. William Goldwyn, sometime Master of Bristol Grammar School, wrote a poetic description of Bristol in 1712 and discussed Bristol Stones without referring to them by name.

In clustering brightness lie,
Like constellations studded in the sky,
Some glistening stones which careful Nature locks
Within the cabinet of the firmest rocks
Whose brilliant sparks, when lapidaries fine
With Eastern pearls in second beauty shine.

Sir Walter Scott was present at the coronation of George IV in 1821 and in a letter describing the scene he wrote:

> Beside the Prince [Prince Esterhazy] sat a good-humoured lass . . . . who wore as many diamonds as if they had been Bristol Stones.

Bristol Diamonds (Marshall, 1888) is the title of a romance, set in the Hot Wells area of Bristol in 1773, in which true love finally triumphs.

On one occasion the hero and heroine walked from the Pump Room towards Clifton and on the way

> There were stalls with men stationed behind them selling the then famous Bristol diamonds. As they passed, the light caught a trinket, shaped like a fat heart, set round with these stones.

This was bought and presented to the heroine but as they walked back past the Pump Room and a knot of young men, one of them remarked:

> "Almost like a little Quaker, but the effect is spoiled by that shining bauble."
> "She takes 'em for real diamonds, I'll lay a wager."

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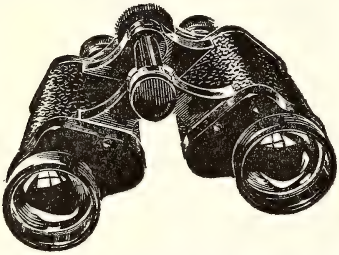

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Ashton Park School, Blackmoors Lane, Bower Ashton, Bristol 3
Bedminster Down School, Donald Road, Bristol 3
Bristol, Clifton and West of England Zoological Society, Clifton, Bristol 8
Bristol Grammar School Field Club, Elton Road, Bristol 8
Clifton College Natural History Society, Clifton College, Bristol 8
Clifton College Preparatory School Natural History Society, Clifton College, Bristol 8

Clifton High School Field Club, College Road, Bristol 8
College of St. Matthias, Fishponds, Bristol
Portway (Upper) School, Penpole, Shirehampton, Bristol
Redland High School for Girls Field Club, Redland Court, Bristol 6
Trafalgar Social Club, Imperial Chemical Industries Ltd., 35 Queen Square, Bristol 1
University of Bristol Animal Welfare Society, The University Union, Queen's Road, Bristol 8
University of Bristol Geological Society, Queen's Building, University Walk, Bristol 8

DURSLEY—

Dursley & District Bird Watching and Preservation Society (Hon. Secretary, N. Lusmore, 28 First Avenue, Dursley, Glos).

KINGSWOOD—

Kingsfield School Natural History Society, Kingswood, Bristol.

* * * *

Book Review

The Birds of the British Isles and their Eggs, by T. A. COWARD, edited and revised by J. A. G. Barnes, London: Warne, 1969. 55s.

Coward's work, first published in 1920 and 1926, contributed greatly to the growth of large-scale bird study in Britain (and became even more widely-known in Enid Blyton's one-volume abridgement, *Birds of the Wayside and Woodland*). Since the last revision by A. W. Boyd in 1950, there have been many changes in bird numbers and distribution, and much new published information. Now, J. A. G. Barnes has contrived, in one volume of 359 pages and 177 plates, to summarise the more important recent literature and to bring the accounts of status up to date, while retaining most of the original descriptive essays. It was, of course, these—succinct, highly informative, yet very readable—which gave Coward's work its special character, and they can still be read with pleasure as well as profit.

Every species recorded five or more times up to the end of 1966 has at least a short account, and some rarities—Wilson's Phalarope is an example—figure amongst the 98 superb black and white photographs, mostly by Eric Hosking and J. B. and S. Bottomley, which replace the earlier half-tone blocks. The colour plates include 179 life-size egg studies and 298 bird illustrations. Six of the latter are new, but the others are the familiar ones, principally Thorburn's, which have been used in all the earlier forms of the work. In the review copy some had acquired an unpleasing reddish tint.

The book is well printed on good quality paper, easy to read and pleasant to handle. The text is accurate, and the only misprint I detected was on the jacket, although a sentence about Shelduck 'parliaments' seems to have vanished from page 64. The ardent list-ticker would probably be better served by Hollom's *Popular Handbook*, but the present work can be recommended to those who want rather more background information, to the serious beginner, and to the general naturalist who wants a single authoritative and up-to-date bird book on his shelves.

S. M. Taylor

REPORT OF COUNCIL
1968

THE membership at the end of the year was 764, including 61 juniors. There are 16 affiliated societies.

At the Annual General Meeting, R. Bradshaw was elected as President, the other Officers and Members of Council also being elected. The Annual Dinner, held in the Senior Common Room, was well attended and Dr. E. A. R. Ennion gave an illustrated talk "Second Thoughts on Owls." The General and Sectional meetings were well supported although the Entomological Section appears low in numbers compared with the past. It would be a pity to lose this, one of the oldest sections, for lack of support.

During the past year the Conservation Committee have worked closely with the Northern Area of the Somerset Trust for Nature Conservation (S.T.N.C.) and indeed supply three of the five committee members for the Northern Area. Several reports of spoliation in various districts were investigated and either found to be in need of action by the S.T.N.C. or the Conservation Warden, or to be watched so that the spoliation did not spread. At the meeting held in November Mr. M. D'Oyly was welcomed to the committee. He is an Assistant Regional Officer in Gloucester, one of four appointed by the Nature Conservancy to the South West.

With regret we record the following deaths: Prof. J. E. Harris, Mr. F. C. Perry, Col. K. A. P. Dalby, Miss D. L. Pratt, Miss H. C. Davis and Miss L. A. Koritnik.

GWYNNETH STERNE, *Hon. Secretary.*

HON. LIBRARIAN'S REPORT
1968

106 books and 63 journals were borrowed by 36 members during the year.

Exchanges have recently been discontinued with the Queckett Microscopical Society and the Liverpool and Manchester Geological Society.

Thanks are once again due to Mrs. M. J. Rogers and Mrs. A. J. Hollowell for their work in the running of the library.

R. BRADSHAW, *Hon. Librarian.*

REPORT OF ENTOMOLOGICAL SECTION
1968

AT the Annual Business Meeting on 16 January the following were elected: President, Mr. J. F. Burton; Secretary, Mr. P. F. Bird; Assistant Secretary, Mr. A. D. R. Brown; Committee, Messrs. D. G. Gibb, K. H. Poole, T. B. Silcocks, C. W. Wiltshire.

During 1968 the following meetings were held:

Mar. 12: The Evolution of Butterfly Migration by Mr. R. R. Baker, B.Sc.
June 8: Clevedon, for insects and birds. Mr. J. F. Burton. Joint meeting with Junior Section.
July 13: Peat Moors and Polden Hills. Mr. T. B. Silcocks.
Aug. 10: North Lodge, Gloucestershire. Mr. and Mrs. R. E. Knight and Mr. D. G. Gibb.
Oct. 22: Conversazione at Mr. A. D. R. Brown's home.
Nov. 12: Annual Exhibition at the City Museum.

P. F. BIRD, *Hon. Secretary.*

The Hon. Treasurer in Account with the Bristol Naturalists' Society

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31 DECEMBER, 1968

Dr.

1967 £ s. d.				£ s. d.	£ s. d.	£ s. d.
	To	Members' Subscriptions:				
646 18 6		Full Members	1966/7	12 10 0		
			1968	623 10 0		
			1969	23 2 6		
					659 2 6	
63 10 0		,, ,, of the same household	1967	12 6		
			1968	61 5 0		
			1969	1 17 0		
					63 14 6	
16 5 0		Corresponding Members	1967	1 5 0		
			1968	13 15 0		
			1969	1 5 0		
					16 5 0	
22 7 6		Associates	1967	12 6		
			1968	20 12 6		
			1969	3 2 6		
					24 7 6	
27 13 0		Juniors	1968	19 13 0		
			1969	1 17 6		
					21 10 6	
26 10 0		Affiliated Societies	1968	21 10 0		
					21 10 0	
						806 10 0
803 4 0						
	,,	Donations				10 2 6
—	,,	*Proceedings* (1966/7):				
		Grants, authors' contributions, donations		102 5 0		
		Separates		55 1 9		
		Subscribers (1966)		4 18 5		
186 11 1	,,	Advertisements		67 0 0		
		Sales of Publications		8 7 8		237 12 10
989 15 1						
7 2 0	,,	Field Committee: surplus over expenses				—
2 9	,,	Sale of Badges				6 4 0
1 2 0	,,	Profit on Dinner				2 3 0
2 8 4	,,	Interest on deposit in Post Office Savings Bank				16 6
33 8 5	,,	,, ,, National Development Bonds				27 10 0
1,033 18 7						1,090 18 10
12 6	,,	Members' contributions to "Harry Savory" Fund				1 15 0
280 7 6	,,	Re Film Show				– – –
646 15 5	,,	Balance from last account				932 5 11
£1,961 14 0						£2,024 19 9

Cr.

1967 £ s. d.				£ s. d.	£ s. 4
161 16 7	By	General Printing and Stationery		185 0 9	
125 13 0	,,	Postages and telephone		122 19 7	
1 0 0	,,	Cheque books, etc.		15 0	
12 0 0	,,	Clerical assistance		11 0 0	
– – –	,,	Purchase of typewriter		21 19 0	
					341 14 4
300 9 7					
489 16 9	,,	*Proceedings* (1967, including separates)			590 3 6
32 2 0	,,	Books		25 4 0	
– – –	,,	Bookbinding		20 0 0	
39 16 6	,,	Subscriptions for journals, etc.		35 14 0	
1 0	,,	Rent (of library room)		1 0	
4 19 0	,,	Fire insurance (library)		4 19 0	
					85 18 0
	,,	Contributions:			
3 5 0		Council for Nature, etc.		6 5 0	
– – –		Steep Holm Trust		18 0 0	
					24 5 0
21 18 9	,,	Fares and expenses of general meetings			16 1 0
– – –	,,	Field Committee: excess expenditure			1 1 5
36 19 6	,,	Purchase of Badges			– – –
100 0 0	,,	Grants to Sections:			
		Botanical		10 0 0	
		Entomological		10 0 0	
		Geological		15 0 0	
		Mammal		10 0 0	
		Ornithological		30 0 0	
		Junior		10 0 0	
					85 0 0
1,029 8 1					
					1,144 3 3
	,,	1967 Film Show: Balance of expenses paid			209 8 6
	,,	Balances to next account:			
307 12 9		*Cash in bank	54 15 9		
		less unpresented cheques	7 16 0		
				46 19 9	
33 3 7	,,	Deposit in Post Office Savings Bank		34 0 1	
200 0 0		£200 5½% National Development Bonds		200 0 0	
330 0 0		*£330 5% Do.		330 0 0	
61 9 7		In hands of Field Committee		60 8 2	
					671 8 0
£1,961 14 0					£2,024 19 9

*Including the "Harry Savory" Illustrations Fund, £40 2s. 6d.

NOTE.—The accounts do not record balances held by sectional treasurers and the Ornithological Section Special Fund of £74 5s. 0d.

REPORT OF BOTANICAL SECTION 1968

AT the Annual General Meeting in the Small Geology Lecture Theatre of the University on 22 January, 1968, the following officers were elected: President, Dr. T. E. T. Bond; Secretary and Treasurer, Miss I. F. Gravestock; Committee: Mrs. C. H. Cummins, Mrs. N. Vaughan Davies, Dr. A. F. Devonshire, Mr. J. A. Eatough, Dr. R. M. Harley, Mr. P. J. M. Nethercott, Miss A. M. Sampson and Dr. C. E. D. Smith.

The wild plant table at the Bristol Museum continued to be much appreciated, and thanks are offered to Mr. A. Warhurst and Mr. P. F. Bird of the Museum and to Mr. E. S. Smith and Mrs. C. H. Cummins, as well as to all members who contributed specimens.

The following winter meetings were held during the year:—

Jan. 22:	Annual General Meeting and Progress Report on the Somerset Flora by Capt. R. G. B. Roe; also Members' Evening.
Feb. 26:	The Garden at Tresco, by Mr. D. A. J. Little, N.D.H.
Oct. 28:	Members' evening, with transparencies.
Nov. 25:	Lichens and their Problems, by Dr. D. H. Brown.

The following field excursions took place under the leadership of those shown:—

May. 9: Avon Gorge, for bryophytes.
Dr. R. M. Harley.

April 27: Sand Point.
Mrs. N. Vaughan Davies.

Mar. 14: Dundry.
Dr. A. F. Devonshire.

May 25: Churchill to Cheddar via Tynings.
Mr. C. H. Cummins.

At Rowberrow *Anaphalis margaritacea* and *Convallaria majalis* were found, and *Thlaspi alpestre* was still extant.

June 11: Siston and Rodway Hill.
Mr. P. J. M. Nethercott.

June 15: Berrow Marsh.
Mr. P. J. M. Nethercott.

Juncus subulatus is flourishing, but *Holoschoenus vulgaris* is somewhat diminished.

July 9: Malago Vale, to record Somerset flora.
Dr. A. F. Devonshire.

A visit the evening before the disastrous floods! Several interesting aliens found.

July 13: Somerset Levels.
Mr. P. J. M. Nethercott.

Many interesting marsh plants seen, including *Rhynchospora alba*, *Platanthera bifolia*, *Drosera rotundifolia* and *Sparganium minimum*.

July 24: Course of the Trym.
Mr. C. H. Cummins.

Some flood results seen.

Aug. 3: Easton to Coxley, to record Somerset flora.
Miss I. F. Gravestock.

Aug. 24: Steep Holm.
Mr. P. J. M. Nethercott.

Good display of *Inula crithmoides*.

Sept. 21: Fungus Foray to Forest of Dean.
Dr. T. E. T. Bond and Dr. C. E. D. Smith.

Joint meeting with North Gloucestershire Naturalists' Society. 50 – 60 spp. found.

Members of the Botanical Section of the London Natural History Society spent the Spring Holiday weekend in Bristol and visited the following sites:—

Berrow Marsh and Brean Down (Leader: Dr. A. J. Willis); Charterhouse, Cheddar Gorge and Cheddar Wood (Leader: Miss I. F. Gravestock); and Badgeworth Nature Reserve, Barnsley Warren and Cotswold Woodlands (Leaders: Dr. M. H. Martin and Mr. D. M. Barling). The party spent a very enjoyable weekend, and saw many of the rare plants of the district.

I. F. GRAVESTOCK, *Hon. Secretary.*

REPORT OF JUNIOR SECTION
1968

THE Section was run during the year by a Committee of Dr. C. E. D. Smith (President), Miss D. M. Bussell (Secretary), Miss E. Lenton, Mr. A. J. Hollowell and Mr. R. M. Curber. Mr. and Mrs. Hockey resigned during the year after many years of loyal service to the Juniors.

An active programme was carried out with numerous indoor and outdoor meetings. The three weekend meetings—two on Mendip, one on Dartmoor—were outstandingly successful.

Our very difficult Summer Quiz attracted eight entries, which was very creditable with the prize going to Miss J. Land.

An innovation was the production of "Animag" which we hope will become a regular production giving news of junior members, their ideas and activities. The inspiration for this magazine came from Miss S. Caola, who was the first editor.

D. M. BUSSELL, *Hon. Secretary.*

REPORT OF GEOLOGICAL SECTION
1968

THE Annual Business Meeting of the Section was held on 13 January, 1968 when the following officers were elected: President, Mr. I. H. Ford; Vice-president, Mr. R. G. Payne; Hon. Secretary, Mr. W. O. Stock; Hon. Field Secretary, Mr. D. Hamilton; Committee: Professor D. L. Dineley and the Student President of the University Geological Society (both *ex-officio*); Messrs. A. B. Hawkins, A. E. Frey, N. H. Hollingsworth, C. E. Leese, D. Addison, R. Bradshaw, R. W. Ashley and Mrs. M. Scawin. After the business part of the meeting was concluded the President, Mr. I. H. Ford, gave an address on some aspects of his field work at the University, including the measurement of radiation in rock samples and on the sea bed. Other lecture meetings held were as follows:—

Feb. 15: Mr. C. E. Leese: Around Europe with the Geologists' Association. Mr. Leese based his talk on an excellent series of slides ranging from the massive dignity of the Jura Mountains to the pyrotechnics of Stromboli.

Mar. 21: Mr. Bradshaw, University of Bristol: The Caledonides of Northern Norway. After some general remarks on the nature of the rocks in the area Mr. Bradshaw went on to talk about his main interest in the area, the Fauske Conglomerate, and in particular the deformation of this Conglomerate, which was exhibited not only by the gross structure but also by the individual pebbles of marble.

Oct. 17: Mr. R. G. W. Braunstrom of British Petroleum: North Sea Gas. The speaker linked the economic and geological aspects of the search for gas in the North Sea. The greatest concentration of industry in the world lies adjacent to the North Sea shore-line and this provides the economic incentive.

Nov. 21: Professor D. L. Dineley, University of Bristol: Geology in the Soviet Union, 1968. Centred around a conference held in Russia on the Devonian/Silurian boundary, this illustrated talk gave a fascinating glimpse into some aspects of life in the U.S.S.R.

The following Field meetings took place during the year:

Apr. 27: Geology and Morphology of the Wye Valley: leader, Mr. V. D. Dennison.
May 18: Mesozoic rocks of Garden Cliff, Westbury-on-Severn: leader, Mr. D. Hamilton.
June 30: Geology of the Glamorgan Coast: leader, Mr. D. Hamilton.
July 28: Jurassic Rocks in the Yeovil Area: leader, Mr. H. Prudden.

W. O. STOCK, *Hon. Secretary.*

REPORT OF ORNITHOLOGICAL SECTION 1968

'THE WREN
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THE KING OF
ALL BIRDS
PS

At the 44th Annual General Meeting in January, Mr. G. A. Forrest and Mr. S. M. Taylor were re-elected as President and Hon. Secretary respectively. Miss J. E. Adam, Miss M. Dennison, Miss C. Graham, Mrs. C. E. Hughes and Mr. D. Warden were elected to the Committee, and Messrs. A. E. Billett, P. J. Chadwick, H. R. Hammacott, M. A. Ogilvie and J. F. Rowe were re-elected. The meeting adopted a set of Rules for the conduct of the Section's business.

Eight indoor meetings were held, with an average attendance of 75, the lowest (24) on March 1 and the highest (106) on Nov. 1. The subjects and speakers were:

Jan. 17: Annual General Meeting. Wild Birds and the Law, by Mr. G. A. Forrest.
Feb. 21: Joint Meeting with R.S.P.B. Avocets and other Problems, by Mr. P. J. Olney.
Mar. 1: Annual Fieldwork Meeting, 1967-8.
Mar. 15: Films—'Lune Valley' and 'Call of the Running Tide.'
Oct. 16: Annual Fieldwork Meeting, 1968-9.
Nov. 1: Some Birds of Central Wales, by Mr. P. E. Davis.
Nov. 22 Saltee, Seabird Island, by Dr. J. J. M. Flegg.
Dec. 11: Living with Nature, by Dr. B. Campbell.

There were field meetings at Velvet Bottom, Mendip (April 27, in torrential rain), the Forest of Dean (May 4), Littleton-upon-Severn (May 20), the Quantocks (all-day, May 26), Wavering Down (June 1) and Damery (June 5). We are grateful to those who acted as leaders, helpers and organisers for these outdoor activities, and to members who provided overnight hospitality for visiting speakers.

Mr. A. E. Billett organized a continuation of our 1967 enquiry into the local status of the Sparrowhawk, and Mr. G. Sweet continued to organize the remainder of our bird-of-prey studies. Small numbers supported the B.T.O.'s Common Birds Census and Nest Record Scheme, our breeding-season census of Shelduck, the Bristol Ringing Group and the first year's work locally on the new B.T.O. 'Atlas of Breeding Distribution' project. Miss C. Graham continued to organize the Survey of Birds of the City, and contributed much of the fieldwork. Informal survey work continued in the Gordano Valley and a similar study was begun of the R. Avon from Hotwells to Sea Mills. We invite interested members, skilled and unskilled, to join in any of these projects.

S. M. TAYLOR, *Hon. Secretary.*

REPORT OF MAMMAL SECTION 1968

At the A.G.M. on January 23, 1968 Mr. A. F. Jayne was elected President, Mrs. A. R. Holeton as Secretary, Mr. R. G. Symes as Mammal Recorder, and the following as Committee members: Messrs. R. M. Curber, F. H. Rawlings, and K. Cook. Miss E. Lenton has been acting as Field Secretary throughout the year. The retiring President Dr. R. J. G. Savage gave an address on "Australian Mammals."

During the year the following indoor meetings were held:—

Mar. 25:	Mammal Fauna of the Serengeti National Park by Dr. C. J. Pennycuick.
Oct. 22:	Ringworm in Mammals, by Dr. M. English.
Nov. 19:	Bats, by Mr. R. Ransome.
Dec. 6:	Otters, by Miss E. Hurrell and Mr. G. Moysey.

Field meetings during 1968 included:

Feb. 4: Headlight Fox Spotting: Leader: Mrs. A. R. Holeton.

Between 4 a.m. and 6 a.m. 16 foxes were seen within the city boundaries, many of these on the Downs.

Apr. 28: Bottle Hunt and Hedgehog Road Survey: Leaders: Mr. R. G. Symes and Mr. F. H. Rawlings.

Eight hedgehogs were seen dead on roads in Somerset and Gloucestershire, and five species of small mammals identified from remains in bottles found in laybys.

May 10: Badger Watch: Leader: Mr. A. F. Jayne.

In addition to badgers, foxes and rabbits were seen.

June 22/23: Devon Weekend. Leader: Mr. J. A. Eatough. A visit was made to the Pengelly Cave Research Centre. The trip also included a talk and film on the Deepdale red squirrels, a morning on Bolt Tail cliffs, and an enjoyable afternoon at Moorgate where the party saw Mr. Hurrell's tame Grey Seal "Atlanta," the dormouse colony, and a wild dormouse using one of the nest boxes in a nearby hazel copse.

July 20: Oakford. Leaders: Mr. R. M. Curber and Mr. T. Hardy. Badger setts and fox earths were visited and Longworth traps, set the previous evening, were examined.

Sept. 22: Quantock Hills. Leader: Mr. J. D. L. Fleetwood. The party walked round the Nature Trail in Forestry Commission plantations and towards Wills Edge above Crowcombe Park. Several sets of clear deer slots were seen though no animals were actually sighted.

Our knowledge about the distribution of local mammals has increased steadily and all records provided by members are much appreciated. 1969 is the final year of the Mammal Society survey so our efforts will be concentrated towards filling in some of the gaps and our field meetings for 1969 have been planned with this in mind.

A. R. HOLETON, *Hon. Secretary.*

ACCOUNT OF THE GENERAL MEETINGS 1968

ATTENDANCE at the General Meetings continues good. The 105th Annual General Meeting was held on January 25 when the Officers and Members of Council were elected with R. Bradshaw as President. The retiring president, F. R. Sterne, gave an address on "Further Reminiscences and Present Observations"—a continuation of his address of the previous year.

On February 1 Dr. J. H. Crook spoke on "Baboon Studies in Ethiopia," where the behaviour patterns of differing monkey troops were shown to be determined by terrain and weather conditions.

On March 7 Mr. A. P. Carr gave a talk on "Recent theories of the Chesil Bank formation", briefly outlining the history of thought on the origins and causes of the pebble grading.

On Oct. 3 Dr. Mary Gillham gave a beautifully illustrated lecture entitled "The Natural History of some Islands in the Southern Hemisphere." She showed the ecology and life cycles of some of the animals and the birds with their habitats.

On Nov. 7 Prof. E. J. Denton gave a fascinating talk on "Reflections in Fishes," emphasising the physical aspects of fish scales which help in camouflage.

On Dec. 5 Dr. H. F. van Emden spoke on "Why Insects are Pests," showing, in each case considered, the reason to be due to man upsetting the original 'balance of nature.'

GWYNNETH STERNE, *Hon. Secretary.*

GENERAL FIELD MEETINGS

FIFTEEN field meetings were held during the year and were generally well supported. A Social Evening was also held.

A list of the meetings and leaders with some indication of the main objects of interest is given below. A more complete account is kept in the records of the Field Committee.

Jan. 21: Swanbridge (opposite Sully Island) and Barry Docks; sea-birds and waders. Mr. H. G. Hockey.

Feb. 11: Beachley, shore near the bridge; sea-birds and waders. Mr. H. G. Hockey.

Mar. 2: Social Evening; an illustrated talk on Foula and field activities in the Brendon Hills. Mr. Martin Kamm.

Mar. 31: A 4-mile walk up the wooded Hodders Combe to the moorland top of the Quantocks, returning by the ridge; plants, birds, red deer, and insects. Miss Rachel Lee and Mrs. Rosemary Lovell.

Apr. 12: Dunkery Gate to Dunkery Beacon and Webbers Post; moorland birds. Porlock Weir, early swallows and house-martins. Mr. and Mrs. H. G. Hockey.

May 5: Dawlish Warren. Sea-birds (including 3 species of tern), waders, and other birds; shore life; sand-dune plants (including *Romulea*). Mr. Bernard King.

May 11-12: Week-end at Gower, including the Oxwich and Whiteford National Nature Reserves. Plants and birds. Miss Rachel Lee and Mrs. Rosemary Lovell.

May 15: Inglestone Common; woodland plants and birds, including nightingales. Mr. D. A. C. Cullen.

June 9: Forest Nature Trail in Ffawyddog Wood, Grwyne Fawr Valley, Black Mountains; trees and birds. Mr. H. G. Hockey.

June 19: A walk from Burrington to Rowberrow in rather wet conditions. Plants and birds. Mr. T. Silcocks.

July 3: A walk through Whitcliff Deer Park, Berkeley, where many fallow deer and a few red deer were seen. Miss A. M. Sampson.

July 6: Christchurch Nature Trail, near Coleford, Forest of Dean. A 4-mile walk through mixed woodlands. Trees, plants, birds, signs of mammals, derelict iron mine, working coal mine, and an underground stream. Dr. A. F. Devonshire.

Aug. 24: Dodington Park. Trees, birds, and mammals. Miss C. Groves.

Sept. 28: Yarnbury 'castle' (an Iron-age and Neolithic Camp); barrows near-by; Stonehenge, the Cursus, and Normanton barrows; Old Sarum. Archaeology. Mr. A. C. K. Fear.

Oct. 27: Soudley Valley; a walk by ponds and plantations. Falconry Centre, where birds of prey are kept, and the party saw a falcon flown. Mr. H. G. Hockey, Miss C. Groves, and Dr. A. F. Devonshire.

Nov. 17: Brownsea Island, Poole Harbour. The party visited the northern half, managed by the Dorset County Trust, including pine woods, fresh-water marsh, reed-marsh, and a salt-water lagoon; birds (including many duck), red squirrels and mosses. Mrs. Rosemary Lovell.

A. F. DEVONSHIRE, *Hon. Field Secretary.*

ACKNOWLEDGMENT

Thanks are due to the British Broadcasting Corporation and to the Colston Research Fund Committee of the University of Bristol for grants towards the cost of publication of original papers in this issue of the PROCEEDINGS.

BRISTOL BOTANY IN 1968

By A. J. Willis

After a cold February, a dry and sunny March and a sunny April promised an early season, but this was somewhat checked by cold, wet and dull conditions during May. The most notable features of the weather in a fairly average year were the very wet July (the record amount of 5.10 inches of rain fell on a single day in July at Long Ashton), which resulted in extensive flooding, and a very dull but warm October (the warmest for 47 years) which extended the flowering season for some species.

On 12 March 1968, 101 acres of Ebbor Gorge were declared as a National Nature Reserve. This dry gorge of Carboniferous limestone on the southern face of Mendip has long been known for its beauty, its woodland and scrub communities (the ground flora includes *Geranium sanguineum*, *Campanula trachelium* and *Platanthera chlorantha*), its rock surfaces with a rich assemblage of bryophytes, its animal life and its caverns containing remains of former fauna and Neolithic man.

A notable find in 1968 was a small population of the Fly Orchid with flowers of unusual appearance in Leigh Woods; also of interest is the discovery of new localities for Dodder, and for *Montia perfoliata* and several other aliens. Mrs. Appleyard has continued to add to the list of bryophytes, and of special note are her discoveries, south of the area covered by this report, of *Pottia caespitosa* at Moorlinch (new county record), *Philonotis caespitosa* near Gasper (new v.c. record) and *Seligeria paucifolia* near Maiden Bradley (new county record). Another important addition to the bryophyte flora is *Rhytidium rugosum* found on Mendip. Reports of persistence of plants in known localities include *Geranium purpureum* under Leigh Woods (*R.M.H.*), *Vicia bithynica* at Hursley Hill, near Pensford (*J.F.H.S.*), *Inula helenium* at Yarley, near Wells (*I.F.G.*) and *Allium oleraceum* at Abbots Leigh (*T.E.T.B.*). Elsewhere in this issue is an account by M. C. Smith of the seasonal behaviour and factors influencing the abundance of Duckweeds in N. Somerset, a favourable area for such a study as in certain sites all five species of Duckweed in Britain occur together.

In October 1967 renovations were made under a preservation order to a historic cottage, in Wood Lane, Horton, near Chipping Sodbury, believed to date from at least 1460 and probably earlier. In an area where most houses are of Cotswold stone, the wattle and daub construction of the cottage is of interest, and repairs to the roof revealed a complete coat of the original thatch under the usual reed thatch. Samples of the original thatch were supplied to me by Mr. B. W. Whitemore of 'Master Thatcher,' The West Lodge, Ash Priors, near Taunton, who was involved in thatching the cottage. Mr. Whitemore reported that beneath the usual reed thatch the original coat contained "a type of grass . . . never encountered previously, the majority ranging from 30 to 40 inches long." Examination of a sample of the original thatch showed that it was made up of about three-quarters Tufted Hair-grass, *Deschampsia cespitosa* (L.) Beauv., and one-quarter Creeping Soft-grass, *Holcus mollis* L. Although much of the thatch crumbled readily to dust, some specimens were sufficiently well preserved to show the structure of the spikelets, and material has been placed in the Herbarium at Kew. Dr. C. E. Hubbard, who confirmed the determination of the two grasses from the thatch, mentions John Evelyn (*The Compleat Gard'ner*, 1693) who refers to houses "clad in winter with a thatch of hay or straw". It seems probable that grasses occurring in hay were used in mediaeval times for thatching; where straw and reed (*Phragmites communis* Trin.) were scarce, meadow grasses might have proved convenient thatching material. *Deschampsia cespitosa*, a tussock forming, strong growing, tall, tough leaved grass, often abundant especially towards the edges of wooded areas, would make quite good thatch. *Holcus mollis* is a common associate and could easily be included in the thatch, although may not itself have been selected, being much softer in texture than *Deschampsia*. Both grasses are widespread and plentiful in Gloucestershire. Mr. J. R. B. Arthur has examined 15th and 16th century wall plasters from several areas and notes that grasses used in binding them include *Deschampsia cespitosa*, *Agrostis* spp., *Holcus* spp. and *Cynosurus cristatus*. Mr. Arthur has also examined the roofing of a 16th century Devon farm building and identified *Holcus lanatus*, *Agrostis* sp., *Lolium temulentum*, *Chenopodium album*, *Rumex obtusifolius* and other plants. *Phragmites communis*, the Common Reed, was "particularly liked" for reed wattle and daub and was used extensively in Sussex cottages for bedroom ceilings.

Names of contributors of several records are abbreviated thus:

J.A., Mrs. J. Appleyard
T.E.T.B., Dr. T. E. T. Bond
A.F.D., Dr. A. F. Devonshire
I.F.G., Miss I. F. Gravestock
R.M.H., Dr. R. M. Harley
S.C.H., Mrs. S. C. Holland
P.J.M.N., P. J. M. Nethercott
R.G.B.R., Capt. R. G. B. Roe, R.N.
J.F.H.S., Dr. J. F. Hope-Simpson
D.M.S., Dr. D. Munro Smith
A.J.W., Dr. A. J. Willis

G: Gloucestershire
S: Somerset

Ranunculus ophioglossifolius Vill. Measures carried out by the Gloucestershire Trust for Nature Conservation, guided by the Badgeworth Reserve Management Committee, on common land near Hawkesbury, **G.**, where Mrs. C. I. and N. Y. Sandwith discovered the Snaketongue Crowfoot in 1926, have increased the population and made its continued existence more certain. Although the plant was found intermittently at the site at least until 1953, it was later feared extinct. In late summer 1965, hand clearing of a small area and disturbance to give bare soil conditions were undertaken, these operations having been shown to favour the plant at Badgeworth. In June 1966 about one hundred short, sturdy plants were recorded on the rather bare mud of the pond, some three-quarters of them flowering. No clearing was undertaken in 1966 and no plants were seen in 1967. However, clearing and soil disturbance in late summer 1967 were followed by the occurrence of about ten plants (some flowering) in 1968. These observations reflect the long viability of seeds and the dependence of the plant on bare soil pockets (such as those created by cattle treading), *S.C.H.*, *E. Milne-Redhead* and *Dr. L. C. Frost*.

R. sceleratus L. With *Bidens tripartita* L. and *Hippuris vulgaris* L. on N.E. shore, Chew Valley Lake, **S.**, *A.F.D.*

Aquilegia vulgaris L. One plant by roadside, Limeburn Hill, near Chew Magna, **S.**, *A.F.D.*; also on rocky ground away from houses by River Frome between Frenchay and Hambrook, **G.**, *D.M.S.*

Coronopus squamatus (Forsk.) Aschers. Waste ground, with *Epilobium adnatum* Griseb., *Artemisia absinthium* L., *Solidago virgaurea* L. and *Verbena officinalis* L., Upper Malago Vale, Bristol, **S.**, *A.F.D.*

Thlaspi arvense L. Barley field, Old Park, Abbots Leigh, **S.**, *T.E.T.B.*; and waste ground, Upper Malago Vale, Bristol, **S.**, *A.F.D.*

Viola hirta L. West Hill, Wraxall, **S.**, *E. S. Smith.*

Chenopodium polyspermum L. A few plants on site of new road, Nailsea, **S.**, *E. S. Smith*, comm. *P. F. Bird*, conf. *A.J.W.*

Buxus sempervirens L. Three specimens, the largest estimated as about 100 years old, on steep limestone cliffs, Bourton Combe, **S.**, *Backwell County Secondary School*, reported in *Proc. bot. Soc. Br. Isl.* **7**(3), 389-90, 1968. Perhaps bird sown; in comparable sites (e.g. Goblin Combe) Box has been planted for cover for game.

Genista anglica L. Large patch on rough ground between Rodway Hill and Siston Common, **G.**, *P.J.M.N.* and *D.M.S.*

Medicago arabica (L.) Huds. Abundant and long established in field sloping down to River Frome, Downend, **G.**, *D.M.S.*

Trifolium medium L. Roadside, near Bishop Sutton, **S.**, *A.F.D.*

Vicia tetrasperma (L.) Schreb. Plentiful in plantation near Westridge Wood, Wotton-under-Edge, **G.**, *S.C.H.*, *F. S. E. Fawkes* and *Lady Ricketts.*

Sison amomum L. A few plants in two localities, Abbots Leigh, **S.**, *T.E.T.B.*

Anagallis tenella (L.) L. A patch, about two square feet, surviving on Black Down, Mendip, **S.**, *P.J.M.N.* Probably now of great rarity here.

A. foemina Mill. Waste ground, Bury Hill, Winterbourne, **G.**, *D.M.S.*, det. *P. G. Taylor.* Distinctive of the species are the narrow leaves and narrow petals, not overlapping.

Gentianella amarella (L.) Börner. Ashton Park, Bristol, **S.**, *J. T. Roberts.*

Symphytum tuberosum L. Garden weed, Redland, Bristol, **G.**, *D.M.S.*

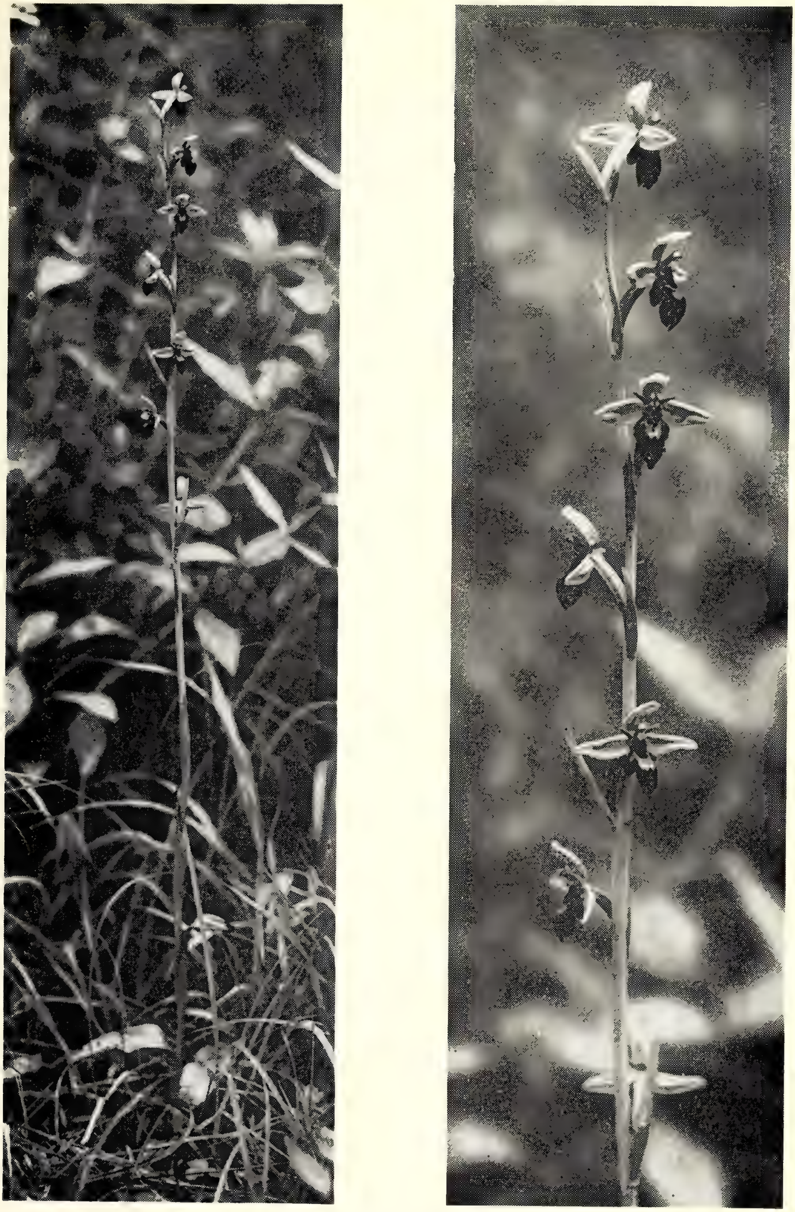
Cuscuta epithymum (L.) L. In good quantity, growing on *Lotus corniculatus*, *Lathyrus pratensis* and *Daucus carota*, on banks by disused railway between Midford and Wellow, **S.**, *R.G.B.R.* and *Mrs. Roe.*

Chaenorhinum minus (L.) Lange. Plentiful on old railway track, both at Shapwick, *Miss J. A. Crook*, conf. *A.J.W.*, and Ashcott, **S.**, *P.J.M.N.*

Campanula trachelium L. Several plants on old wall top in dense woodland, Markham Valley, **S.**, *T.E.T.B.*

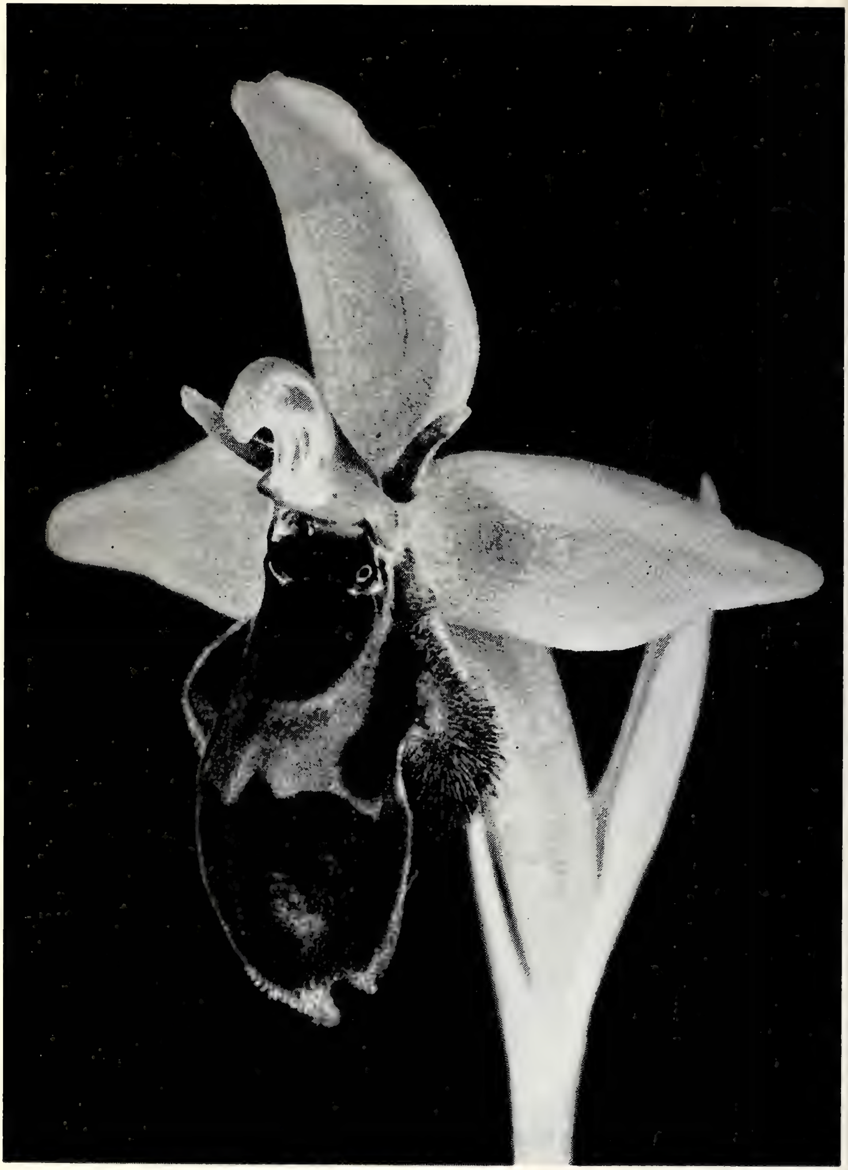
Senecio viscosus L. Disused railway track, Mangotsfield, **G.**, *D.M.S.*; in the same locality was a white-flowered form of *Centaurea scabiosa* L.

Sonchus arvensis L. var. *glabrescens* Guenth., Grab. & Wimm. Waste ground, Bury Hill, Winterbourne, **G.**, *D.M.S.*, det. *J. E. Lousley.* For discussion of this taxon see *Proc. bot. Soc. Br. Isl.* **7**(2), 151-7, 1968.



Fly Orchid (*Ophrys muscifera*) with flowers of unusual form, Leigh Woods, Bristol.
Left: approx. × $\frac{2}{5}$. Right: approx. × $\frac{4}{5}$.

Photographs by J. A. Eatough



Ophrys muscifera: detail of flower of unusual form from Leigh Woods.

Approx. × 6.

Photograph by J. A. Eatough

Ophrys muscifera Huds. Four plants with unusual flower structure, growing with normal *muscifera*, in wooded part of old quarry, Leigh Woods, Bristol, **S.**, *Dr. M. Flower*, *Dr. I. D. R. Stevens* and *Prof. M. C. Whiting*. The labellum of these plants was strongly convex, with two prominent down-turned lateral lobes and a terminal tripartite lobe, the median tooth being reflexed (Plates XI and XII). The other perianth segments were like those of normal *muscifera*, which the plants resembled in general appearance and stature. *J. P. M. Brenan* and *P. F. Hunt* include this interesting but odd-looking form in *muscifera*, and refer to considerable variation in flower size and shape throughout the range of this species.

Orchis mascula (L.) L. Large population, including some plants with white flowers and unspotted leaves, hillside above Shiplate Wood, Bleadon, **S.**, *T.E.T.B.*

Eleocharis uniglumis (Link) Schult. Marshy field, together with *Carex acutiformis*, *C. disticha*, *C. hirta*, *C. nigra* and *C. panicea*, near the Church, Portbury, **S.**, *R.M.H.*

Rhynchospora alba (L.) Vahl. A very little at Sharpham, **S.**, *P.J.M.N.* Apparently much less common than formerly on the peat moors; White (*Flora*) records it as once plentiful.

Carex distans L. One clump, in 1966, Inglestone Common, Hawkesbury, **G.**, *S. C. H.* and *E. Milne-Redhead;* and in 1965 at edges of ditches behind embankment north of Chapelhouse, near Sheperdine, **G.**, *Dr. D. S. Ranwell* (reported in Journal of North Gloucestershire Naturalists' Society).

C. disticha Huds. Webb's Heath, near Bridgeyate, **G.**, *D.M.S.*

C. muricata L. A small form, viaduct, Winterbourne, **G.**, *D.M.S.*, det. *A. C. Jermy.*

C. pulicaris L. In fair quantity in 1967, Crook Peak, **S.**, *J.A.*

Bromus lepidus Holmberg. Roadside, Abbots Leigh, **S.**, *T.E.T.B.*; and several plants, grassed area, near Red Lodge, Bristol, **G.**, *R.M.H.*

Nardus stricta L. Surviving very thinly around Siston Common, **G.**, *P.J.M.N.* This grass appears now very rare in S. Glos.

ALIENS. Hesperis matronalis L. Waste ground, Bury Hill, Winterbourne, **G.**, *D.M.S.;* in the same locality *Sedum spurium* Bieb.

Erysimum cheiranthoides L. Waste ground, with *Doronicum plantagineum* L., *Medicago alba* Medic., *Oenothera erythrosepala* Borbás and *Papaver somniferum* L., Upper Malago Vale, Bristol, **S.**, *A.F.D.*

Lychnis chalcedonica L. A fine specimen of the Flower of Bristol adjoining rubbish dump, Sharpham Moor, **S.**, *Mrs. I. Hockey.*

Montia perfoliata (Willd.) Howell. A well established colony on the sand hills at Brean, **S.**, *R.G.B.R.* The ground within a thicket of *Hippophae rhamnoides* is thickly carpeted, patches of the plant extending at intervals some 40 yards north and south of the main colony, and also on to the seaward face of the sand hills, indicative of its existence in the locality for a considerable time.

Amaranthus hybridus L. Not sufficiently mature for exact determination, but probably ssp. *incurvatus* (Timeroy ex Gren. & Godr.) Brenan, tip at Kingswood, Bristol, **G.**, *D.M.S.*, det. *J. P. M. Brenan.*

Ononis salzmanniana Boiss. & Reut. A single plant in garden, Stoke Bishop, Bristol, **G.**, *I.F.G.*, det. at Kew. This native of the W. Mediterranean region is known as a casual from bird seed. First record for the area.

Galega officinalis L. Grassy track, waste ground near St. Anne's Board Mills, **S.**, *R.G.B.R.* and *Dr. D. H. Peregrine*, det. *A.J.W.*; and Upper Malago Vale, Bristol, **S.**, *A.F.D.*

Rubus phoenicolasius Maxim. Well established plant on old wall, woodland part of Vowles Bottom, Abbots Leigh, **S.**, *T.E.T.B.*

Anethum graveolens L. Waste ground, Winterbourne, **G.**, *D.M.S.*

Polygonum sachalinense F. Schmidt. At the disused station, Flax Bourton, **S.**, *A.F.D.*

Cannabis sativa L. A large female plant, which set seed, on rubbish tip, Lawrence Weston, **G.**, *P. J. Bauer* and *Miss C. Williamson*, det. *A.J.W.* Also on the site were *Hordeum jubatum* L., *Panicum miliaceum* L., *Setaria italica* (L.) Beauv. and *S. viridis* (L.) Beauv.

Pentaglottis sempervirens (L.) Tausch. Many plants by road, Bower Ashton, **S.**, *A.F.D.*

Brunnera macrophylla Johnston. Grassy field, Yate, **G.**, *B. Smith*, det. *P. F. Bird* and *A.J.W.*

Linaria purpurea (L.) Mill. On wall, near houses, Abbots Leigh, **S.**, *T.E.T.B.*, and Upper Malago Vale, Bristol, **S.**, *A.F.D.*

Galinsoga parviflora Cav. Tip, Kingswood, Bristol, **G.**, *D.M.S.*, conf. *A.J.W.* Also present was *Nicandra physalodes* (L.) Gaertn.

G. ciliata (Raf.) Blake. Several small plants as garden weeds, Chew Magna, **S.**, *Dr. K. C. Allen*, det. *A.J.W.;* also on building site in Nailsea, **S.**, *Dr. T. A. Smith*, comm. *T.E.T.B.*

Anaphalis margaritacea (L.) Benth. Small clump on ride, wooded area, Rowberrow, below Tynings Farm, **S.**, *Mrs. C. H. Cummins.*

Cicerbita macrophylla (Willd.) Wallr. Several flowering and many non-flowering plants on waste land, Cotham, Bristol, **G.**, *Mrs. Wilkinson*, det. *P. F. Bird.*

Juncus tenuis Willd. Garden weed, Stanton Wick, **S.**, *J.F.H.S.*

Cyperus eragrostis Lam. A single plant in vegetable garden where it stayed in flower until the end of December, Abbots Leigh, **S.**, *T.E.T.B.*, det. at Kew. This American species occurs as an alien or garden escape fairly frequently in Britain and seems to become naturalized in S.W. Europe. A first record for the Bristol area.

BRYOPHYTES. Sphagnum compactum DC. Peaty moorland, on top of Black Down, Mendip, **S.**, *J.A.* New to v.c.6.

Cynodontium bruntonii (Sm.) **B., S.** & **G.** Among grit rocks, Highbury Hill, Clutton, **S.**, *J.A.* A first record for v.c.6.

Dicranum strictum Schleich. ex Schwaegr. On stump, Whidcombe Brake, Chelwood, **S.**, *J.A.* Second record for v.c.6.

Pottia starkeana (Hedw.) C. Müll. Old quarry, Wrington, **S.**, *J.A.*

Tortella flavovirens (Bruch) Broth. The Gully, Avon Gorge, **G.**, leg. *D.M.S.*, det. *Dr. A. J. E. Smith*, conf. *A. C. Crunwell.* A first record for v.c.34.

Bryum donianum Grev. Brean Down, **S.**, *J.A.*

Mnium rugicum Laur. Catcott Heath, **S.**, *J.A.* The third localized record for this moss in N. Somerset.

Zygodon viridissimus (Dicks.) R. Br. var. *stirtonii* (Schimp. ex Stirt.) Hagen. On rocks, Frenchay, **G.**, *D.M.S.*, det. *E. C. Wallace.*

Orthotrichum rupestre Schleich. ex Schwaegr. On stone embankment, in 1966, in the estuary of the Parrett, near Huntspill, **S.**, *J.A.* A first record for Somerset.

Scleropodium caespitosum (Wils.) B., S. & G. Winterbourne Down, adjoining River Frome, **G.**, *D.M.S.*, conf. *J.A.*

Isopterygium seligeri (Brid.) Dix. ex C. Jens. On rotten branch in small wood between Mells and Buckland Dinham, **S.**, *J.A.* This rare moss, whose British distribution is mainly in the S.E. counties, is new to Somerset.

Rhytidium rugosum (Hedw.) Kindb. With *Hornungia petraea* (L.) Reichb. and *Rhacomitrium lanuginosum* (Hedw.) Brid. at fringe of broken limestone, Charterhouse, **S.**, *Dr. M. H. Martin* and *J.F.H.S.*, conf. *J.A.* A first record for Somerset. The Mendip locality represents a notable extension of the range of this calcicolous moss, whose nearest known sites are Herefordshire, the Breckland of East Anglia, the Derbyshire limestone and Snowdonia.

Riccardia multifida (L.) Gray. Wet field, Westhay Moor, **S.**, *J.A.*

Solenostoma pumilum (With.) K. Müll. On rocks in ravine, Black Down, Mendip, **S.**, *J.A.* Second record for v.c.6.

Plagiochila spinulosa (Dicks.) Dum. Sheltered site in ravine, Black Down, Mendip, **S.**, *J.A.*

Cephalozia connivens (Dicks.) Lindb. On stump, Highbury Hill, Clutton, and rotten tree trunk in stream, Ebbor, **S.**, *J.A.* Previously recorded in N. Somerset only from the peat moors.

FUNGI. Octospora humosa (Fries) Dennis. Waste ground, bordering tip, Kingswood, **G.**, *D.M.S.*, det. *Dr. R. W. G. Dennis.* An uncommon Ascomycete previously reported by C. Bucknall from Leigh Wood, 1880 (*Proc. Bristol Nat. Soc.* **3**, 137).

I am indebted to Dr. R. J. W. Byrde for meteorological records and I thank Mrs. J. Appleyard and Mr. P. J. M. Nethercott for help in compiling the records. I am also grateful to Dr. C. E. Hubbard for his help and interest concerning the grasses in the old roofing thatch from Horton.

BRISTOL BIRD REPORT 1968

COMPILED BY THE EDITORIAL COMMITTEE OF THE
B.N.S. ORNITHOLOGICAL SECTION
P. J. CHADWICK G. E. CLOTHIER
H. H. DAVIS G. A. FORREST
H. R. HAMMACOTT G. SWEET
S. M. TAYLOR

FOR many years the northern boundary of the Bristol Bird Report area has been a line from Frampton Breakwater through Tetbury to the Wiltshire border. This rather imprecise and artificial limit served as long as our few northern records all came from the New Grounds, south of the line. More recently, however, increasing numbers of records from the whole of the Frampton basin have led to some confusion over which ones should be included in our report. For example, a Baird's Sandpiper record in 1967 was wrongly described as the first for the area because a 1966 record from the same place did not reach us. To permit accurate and consistent reporting, our northern limits have now been extended, with the. active co-operation of the North Glos. Naturalists' Society, to include the whole Frampton basin and to give a boundary readily recognisable on the ground. It seemed expedient at the same time to make the southern boundary more definite also.

With effect from Jan. 1, 1968, therefore, the Bristol Bird Report area is defined as being that part of Gloucestershire (**G.**) lying east of the Severn and bounded on the north by the R. Frome from its mouth at Arlingham Bend inland as far as Dudbridge, then by its tributary south to Avening, and then by the A 434 road through Tetbury to the Wilts. border; and that part of Somerset (**S.**) bounded on the south by the R. Axe from its mouth to Wookey, and by the B 3139, A 371, A 361 and B 3098 roads through Wells, Shepton Mallet and Frome to the Wiltshire border. Brean Down, Steep Holm and The Denny are deemed to lie within the area. From its mouth inland as far as Swineford, the centre-line of the R. Avon is taken as a conventional boundary between **G.** and **S.**; otherwise the political boundary applies.

The Year. Following the latest autumn arrival known, the White-fronted Goose flock at the New Grounds built up to a record level, due at least partly to lack of disturbance consequent on the foot-and-mouth disease precautions then in force—the epidemic ended officially on Mar. 13. Goldeneye were numerous in the S. Midlands early in the year, and some sixty were present at the N. Somerset resrs. in mid-April. The Long-tailed Ducks stayed into the New Year—the one at Barrow Gurney resrs. until Jan. 13, but the Chew Valley bird stayed to the evening of May 27, when it left, flying high to the N. (DW). One had also been present at Frampton Pools; it left on Jan. 2.

On the whole, January was exceptionally mild. Many Lapwing movements were noted locally on the 9th–11th, and large flocks were seen thereafter—presumably refugees from the snow of central and E. England. February started colder, but a fine spell at mid-month produced records of early nesting—a Blackbird's nest in Clifton was complete by the 25th, and a Song Thrush was feeding young on March 5. A trickle of early migrants arrived during March—a Wheatear was seen on the 6th, a Chiffchaff on the 9th, the first House Martin on the 20th, and Swallows next day, but the first Sand Martin record, on the 17th, was if anything later than usual. Migrant arrivals increased with a warm S. air stream from the 26th–29th, and Wood Warblers were singing on the 31st and Redstarts next day.

April opened with cold N. and then E. winds, which halted migration but brought a Serin to the New Grounds—a first record for Glos.—and the first of a few Blue-headed Wagtails to Chew. In the third week, a warm S. wind following a depression produced the main migrant falls. Early Swifts were seen on the 16th, and a Purple Heron was present at Frampton on Severn from the 28th, one of several in the country at that time. May's first half was cold, delaying the breeding season; N. winds then persisted until mild weather set in from the 24th. Showers were frequent from June 19, and there were heavy thunderstorms on July 2 and 10; over five inches of rain were recorded at Long Ashton on the latter date. Flooding was widespread, and much of the N. Somerset moors lay under six inches or more of water for some time. Losses of ground-nesting birds were probably insignificant, but the small mammal and invertebrate populations must have suffered heavily, and ground-feeding birds moved away. Two pairs of Kestrels with young broods left their flooded hunting grounds and did not return for some months. Many Herons fed in the floods, and water fowl gathered in numbers recalling the pre-drainage era, notably on Stoke Moor, where 600 Mallard and 70 Snipe were seen on July 31 (BR). In early

August a depression over France brought N.E. winds in the E., and on these came an invasion of Nutcrackers, already heralded by reports of numbers in the Baltic countries. Over 200 were seen in some 23 counties—more than twice the total of previous records. Two or three reached Somerset, including one at Portishead. Similar weather at the end of the month led to six records of White-winged Black Terns in the country, the highest ever August total. One, at Cheddar, was our fifth; our sixth followed in September. Other European visitors at this time were a Red-necked Grebe at Chew and a Little Egret on the Axe Estuary. Transatlantic species seen in Somerset included a Bonaparte's Gull at Cheddar and a Spotted Sandpiper outside our area, at Durleigh reservoir.

During the second week of September, 10,000 or more Swallows roosted at Chew, where Hobbies preyed on them. Of some 700 ringed, two were caught at a roost at Alderman's Vlei, Cape Province, S. Africa, on Dec. 24 and Jan. 7 1969 (C). The weather was again unsettled from the 12th, with strong winds and some heavy rain. On the 21st, four Grey Phalaropes were seen at separate places in Glamorgan; the same day two appeared at the New Grounds, to be followed shortly by two more at Chew and one at Cheddar res.; by the end of the month some 25 had been reported in S. and W. counties, including three more in Somerset, at Steart. The weather responsible for the Phalaropes also brought a Lapland Bunting, a Glaucous Gull and a Great Skua to the New Grounds, and several of the latter species to N. Somerset.

October was one of the mildest for fifty years; southerly winds brought an influx of Firecrests and Black Redstarts to the country about the 12th and again on the 22–23rd. Black Redstarts were seen here and there in our area up to the end of the year, but our only reports of Firecrests were of two at the New Grounds in November. The disturbed Atlantic weather produced an unprecedented list of American species, but the only local record was of a Semi-palmated Sandpiper at the New Grounds—the first for Glos.—on Oct. 13. Another Great Skua was seen on the 13th at Sand Point, and a week later a small number of Richard's Pipits appeared on the coast S.W. of Clevedon. Annually vagrant in the E., this species has been recorded only four times before in Somerset—in 1893, 1920 and 1960 in the Bristol district, and in 1958-9 near Pawlett.

Many migrants lingered into the mild autumn—a Willow Warbler was singing on Oct. 12 (BATH); House Martins were feeding young on the 6th, and last seen on the 27th (WLR); a Swift on Oct. 29 (GEC) followed many September reports; and Swallows were seen on Nov. 1 (HRH), 2 (WGB), 11 (RA) and 27 (HGH). Ten cold days from Dec. 6—16 were followed by milder weather. A Yellow Wagtail at

Chew on Dec. 23 (RCP), one of several seen in S. England and Ireland during the month, was the latest known in Somerset—the previous latest was one at Mells on Nov. 20, 1923. Late December also saw a record number of Red-breasted Mergansers and a Ferruginous Duck in the area. A Blackcap on Clifton Down on Dec. 31 (RLB) was one of several over-wintering birds seen early in 1969.

Birds of Prey. Since 1964, occasional definite or possible sightings of Goshawks have come from the area between Mendip and the coast; in considering these, it must be noted that several Goshawks are kept and flown locally, and escapes have occurred. Breeding of Sparrowhawks has been confirmed in seven 10-km squares additional to those shown on last year's map. After a period of near-absence, Barn Owls were seen more often and more widely in 1968, though nearly all records were of single birds. Two were found dead on roads; for these, as for a Buzzard found dead at Shute Shelve on Oct. 20 (WLR) we do not know the cause of death. In two other cases, at least a possible cause is known — a Tawny Owl picked up unable to fly at Sand Bay on May 15, which died on the 24th and a Buzzard found dying in Weston Woods in February, both contained pesticide residues (TB). There are other hazards too—we know of two Buzzards, a Sparrowhawk and a brood of Kestrels shot in the area during the last three years, and have reason to believe that a male Hobby too was shot. These incidents, several of which occurred on game preserves, are a sad comment on the ineffectiveness of laws in the face of ignorance or commercial interests.

Duck Counts. Recently, local censuses for the National Wildfowl Counts have been done over a weekend, and not on a given day. With sailing now allowed at Chew Valley res. as well as at Cheddar, disturbance is much increased and duck move frequently among all the N. Somerset reservoirs. These factors combine to make interpretation of the count data very difficult—there is evidence of both over- and under-counting directly attributable to them. We have given totals in the systematic list only where we think they are not excessively distorted, but even these are likely to be less exact than hitherto. Early in the year, too, the extent and accuracy of data were still being affected by the foot-and-mouth disease precautions (see note, p. 363, 1967 Report).

Visitors to Chew often report counts made during a complete circuit of the lake, and some may be unaware of the ease with which miscounting can occur due to disturbance. If a concentration of duck is seen near the start of a circuit, we recommend checking that they are still there at the end.

Common Birds. Collared Doves are so numerous and widespread that they now come into this class; they are met with on the outskirts of villages and in the open country as well as in towns. In the City, a pair nested in 1968 on the steelwork of a crane on the Bristol Royal Infirmary building site, in view of a member patient's ward window. The Avonmouth colony seems to have stabilized in size; the map (Fig. 1) shows a possible reason—the colony has been the origin of most of the ringed birds so far found in Ireland, as well as being a centre for N. and S.W. movements.

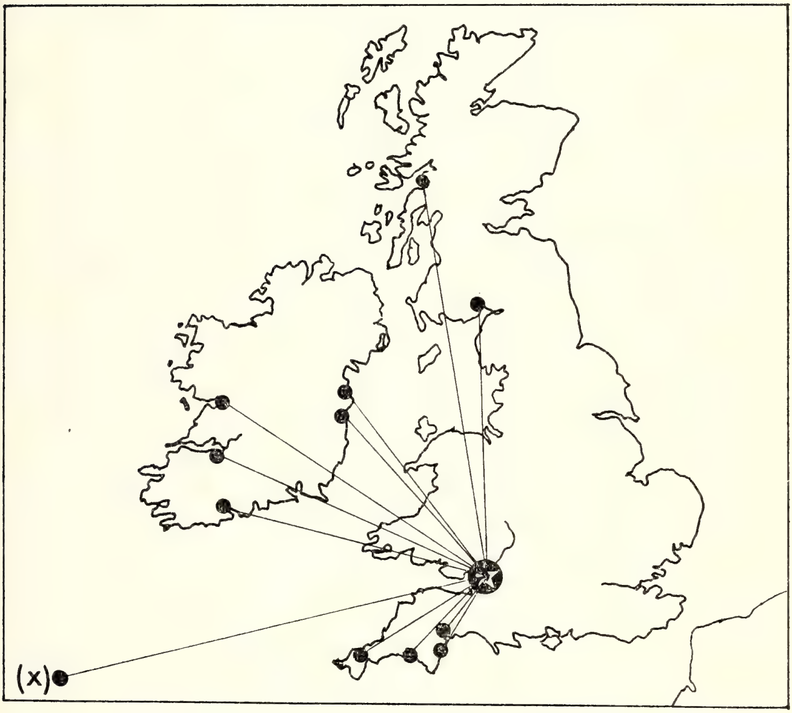


Fig. 1. *Recoveries of Collared Doves ringed at Avonmouth.*
× *—bird caught on fishing vessel.*

A decline in Cuckoo numbers has aroused concern in recent years. The Farmland and Woodland Indices derived from the B.T.O. Common Birds Census fell by 27 and 18 per cent. respectively in 1967, though the former (but not the latter) rose by almost a half in 1968. Our local information is extensive but patchy, and is not adequate for a definitive statement; on the whole, however, it does not suggest any appreciable increase locally. Some observers find

Cuckoos plentiful but others (including some whose work takes them regularly about the countryside) continue to comment on their scarcity.

The Wren's explosive general increase seems to have abated. Its Farmland and Woodland Indices rose by 56 and 44 per cent. in 1967 but by only 9 and 1½ per cent. in 1968. Willow Warblers and Chiffchaffs have become noticeably more abundant in recent years. This is a general and not merely a local change, as the following index figures, quoted from the relevant reports in *Bird Study*, show:

		1964	1966	1968
Farmland	Willow Warbler	72	100	118
	Chiffchaff	65	100	137
Woodland	Willow Warbler	65	100	102
	Chiffchaff	62	100	105

Changes in Habits and Habitats. A Plane tree in Colston Ave., Bristol, was the unlikely site of a single Rook's nest built in March and then deserted. The taste of Blackbirds for outdoor tomatoes has been reported locally, but we hear less of attacks by tits on milk bottles—in one case only about three bottles a year are now affected.

Duchess' Pond, Stapleton, the source of many past reports, was filled in during the summer to make way for the new urban motorway. Building operations in Filton have involved the loss of large hardwood trees, a walled garden, two orchards and two ponds, where Moorhens and many warblers bred and duck, Woodcock and Grey Wagtails were to be seen (RA).

Groups of trees have been planted along the Long Ashton By-pass, opened on Dec. 6; in time, these and the embankments and cutting should provide useful new breeding habitats.

Retrospect. In 1968, Dippers bred on the R. Frome at Stapleton, Bristol. Dr. D. Munro-Smith tells us that his diaries record Dippers breeding there, in Old Court Woods, in 1923; at that time there were usually three pairs—at Wickham Glen, Stapleton and Hambrook. He also recorded Cirl Buntings breeding in 1929 along the Avon towpath—now the Portway—in the locality where they still breed.

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Headings **G.** and **S.** refer to South Gloucestershire and North Somerset, and cover the areas defined on p. 493.

GREAT NORTHERN DIVER *Gavia immer*

S. One, Cheddar res., Nov. 12–Dec. 21, then two to end of year (GLB, BR *et al.*).

GREAT CRESTED GREBE *Podiceps cristatus*

G. and **S.** Bred successfully at Frampton Pools, Tortworth Lake (pr. reared two broods), Blagdon and Chew Valley resrs. and Orchardleigh Lake (RMC, TDE, JH *et al.*). Up to 300 or more, Chew Valley res., Sept. to end year, but exact totals uncertain because of disturbance by sailing.

RED-NECKED GREBE *Podiceps griseigena*

S. Adult in moult, Chew Valley res., Aug. 24 (PJC)—confirmatory details supplied.

SLAVONIAN GREBE *Podiceps auritus*

S. One, Chew Valley res., Jan. 14–Feb. 18 (PC, TRC, NTL *et al.*).

BLACK-NECKED GREBE *Podiceps nigricollis*

S. Single birds, Chew Valley res., Jan. 22, 31; Cheddar res., Apr. 4; and Blagdon res., Apr. 11–13, Sept. 9, Oct. 3 (GBB, NC *et al*). Two, Barrow Gurney resrs., Aug. 3–10 and one to Oct. 6 (AHD, PAR, KEV *et al.*).

Little Grebe *Podiceps ruficollis*

S. Bred, Blagdon res., Chew Valley res. (7 broods) and Locking Pond nr. Weston-s-Mare (RA, AHD *et al.*). One outside french windows of house, East Dundry, Oct. 25 (JSH–G).

Pied-billed Grebe *Podilymbus podiceps*

S. One, Blagdon res., May 23 to June 6 (KELS).

Storm Petrel *Hydrobates pelagicus*

S. Six noted during sea-watch, Brean Down, Sept. 29 (BR).

Manx Shearwater *Procellaria puffinus*

G. and **S.** Single birds over estuary, New Grounds area, Oct. 6–7 (JB,RKB, KJG, MAO). Ten flying up-river, Steep Holm, July 15 (S). Seven off Brean Down, Sept. 29 (BR *et al.*).

Gannet *Sula bassana*

S. Adult, Chew Valley res., Jan. 1 (NTL). Three (2 ads.), Steep Holm, July 15 (S). Single birds, Clevedon, Aug. 11, 18; Woodspring Bay, Aug. 14; and off Sand Point on 18th (RA, TB, AHD). Noted after gales, Axe Estuary, Sept. 21; three, Sand Point, Sept. 23 (RA) and eight, Brean Down on 29th (BR). One, long dead, Clevedon, Nov. 4 (TRC).

Cormorant *Phalacrocorax carbo*

S. Remains of one ringed as juv., Steep Holm, 25.6.56, found Lympne, Hythe, Kent (180 m. E), 19.2.68.

Shag *Phalacrocorax aristotelis*

G. and **S.** One off New Grounds, June 9 (DIMW) and one moving W, Sand Point, Aug. 16 (RA).

Heron *Ardea cinerea*

G. No nests at Frampton on Severn heronry (RKB).

S. At least five nests, Uphill (PC) and 13–14, Newton St. Loe, but success rate low at latter (CRC, MPH). Seven birds on floods, Kenn Moor, July 17 (MVT) and 40, Stoke Moor, July 31 (BR). Up to 24, Chew, and up to six, coast (many records).

Purple Heron *Ardea purpurea*

G. Imm., Frampton Pools, Apr. 28 (RKB, KJG) and on Estuary May 4 (BMK). Record accepted by *Brit. Birds* Rarities Committee.

Little Egret *Egretta garzetta*

S. One, Axe Estuary, Aug. 28 (RA)—accepted by *Brit. Birds* Rarities Committee.

Bittern *Botaurus stellaris*

S. Single birds, Chew Valley res., Jan.–Feb. and Nov.–Dec. (TRC, PGF, DJP, DW *et al.*).

FLAMINGO *Phoenicopterus sp.*

S. Escaped bird present, Chew Valley res., July 18–Aug. 4 and Sand Bay, Nov. 12 (RA, GLB, SJM *et al.*).

See note, p. 496, regarding accuracy of duck counts.

MALLARD *Anas platyrhynchos* *See p. 494.*

G. and **S.** Breeding records from Inglestone Common, Tockington, Newton St. Loe, Stanton Drew, Blagdon and Chew Valley resrs., Kenn and Nailsea Moors and Uphill. Max. numbers on Estuary, mid.-Jan. (1,800) but peak at resrs. in mid-Sept. (2,000) when about 900 at New Grounds.

TEAL *Anas crecca*

G. and **S.** Usual Spring dispersal—under 200 recorded in mid-Mar. (half in **G.**). Early influx on Estuary with 900, New Grounds, Sept. 10; but apart from some temporary movements, counts suggest N. Som. population only some 600 in Nov., fewer in Dec.

GARGANEY *Anas querquedula*

G. Single ♂♂, New Grounds, Mar. 20, May 6 (LPA, MAO) and Aug. 24, 25 (TRC, RMC).

S. Present, spring and summer, Chew Valley res.—usually one pair but 9 (4 ♂♂), July 28 (AHD), and family party of 7 or 8, Sept. 10 (PJC, MAW). Blagdon res.: two, Apr. 18; ♀, Aug. 17 and ♂ on 25; two, Sept. 15 (SJM *et al.*). Male, Stoke Moor, July 31 (BR) and one, Barrow Gurney resrs., Aug. 17 (AHD). Late records, Chew—four (1 ♂), Oct. 12 and two, Nov. 10—latter seen and heard at close range and in flight (PJC).

GADWALL *Anas strepera*

G. New Grounds population fairly steady at *c.* 65 birds (WT) but 80 reported, Dec. 21 (TRC, GPT). Up to 28, Frampton Pools, Jan.-Feb., and up to 10 in autumn (TDE, BAO *et al.*).

S. Breeding season population of *c.* 10–15 pairs, Blagdon and Chew Valley resrs., but only six broods located, all at Chew (RA, PJC). Autumn counts, Chew Valley of 123, Aug. 13 (TRC) and 105 on 17th (PJC) but rapid dispersal, partly to Cheddar res. where total rose from 4, Sept. 7 to 30 by 21st, with even more rapid fall in early October (AHD, TRJ, JAMCG *et al.*).

WIGEON *Anas penelope*

G. and **S.** As usual, numbers at peak in Jan. but some 20% higher than in 1967; majority at New Grounds and Chew Valley res. Present in autumn from Aug. 24 (4, Cheddar res.—RA) with *c.* 200 in area, mid-Sept. and Oct., rising from mid-Nov. to some 3,000 by mid to end Dec. (DCJ, KJ, BK, JDS, GPT *et al.*).

PINTAIL *Anas acuta*

G. New Grounds: 185, Jan. 14; 70+, Feb. 4 and 40, Mar. 3; 93, Dec. 21 (TRC, MAO, DIMW *et al.*) but 300 on 27th (GPT). Only small numbers, autumn, Frampton Pools—max. of 29, Dec. 14 and 21 on 21st (ADL, JDS *et al.*).

S. No large numbers recorded. Total, all main Wildfowl Count areas: 50, end Jan., but only 16 (all at Chew), Mar. 3 (TRC, BR *et al.*); 35–50 in area from mid-Nov., otherwise highest autumn count was 16 over Cheddar, Sept. 15 (PJC).

SHOVELER *Spatula clypeata*

G. and **S.** Approx. 200–250, N. Somerset and 150, New Grounds and Frampton Pools, Jan.–Feb., with rapid fall in early March. Pair bred, New Grounds—3rd record for W.T. (DIMW) and two broods, Chew Valley res. (PJC). Autumn counts: 70 together, Chew Valley res., Aug. 25; *c.* 150, all resrs., mid-Oct.; possibly 300 in area, mid-Nov. (but counts made over two days); 250–300, mid to end Dec. (about half at W.T.).

RED-CRESTED POCHARD *Netta rufina*

G. Full-winged birds from W.T. visit Frampton Pools.

S. Male, Cheddar res., Feb. 24–Mar. 8 (GWB, TRC, BR), joined by three females on 10th (RH, RJL).

SCAUP *Aythya marila*

G. Two, Splatt Bridge, Jan. 7; single females, New Grounds, Jan. 14, Feb. 1, 25 (WT, DIMW). One, Frampton Pools from Feb. 17–Mar. 24 but three (2♂♂) on 30th; female, Nov. 24 and another 'probable,' Nov. 20 to year end (TDE, BAO).

S. Three adult males, Cheddar, Blagdon and Chew Valley resrs., Jan. 11–Apr. 15, then two to May 17 (possibly all same birds). Single male, Blagdon, Sept. 15, then at Cheddar to Dec. 29 and probably same bird at Chew Valley on 31st. A female joined the male at Cheddar, Nov. 20 (BR, who adds that the black on its bill was confined to the 'nail').

TUFTED DUCK *Aythya fuligula*

G. Frampton Pools: *c.* 180 in Jan., but 350 on 13th; 225, Feb., falling to 125 in March–April; two pairs bred (TDE); up to 140, Nov., and 225, Dec.

S. Reservoirs: 450–500, Jan. to March, but 625 in April; 450, Blagdon, April 15 and 500 (same flock?), Chew Valley on 29th. Autumn totals rose from 300, Aug., to 725 in Nov. and 650, mid-Dec. Twenty-one broods, Chew Valley res. (AHD *et al.*).

POCHARD *Aythya ferina*

G. and **S.** Large autumn 1967 numbers fell rapidly after early Jan.—only 550 recorded, mid-Feb.; total at Frampton Pools varied between 130 and 225 with 140 still present, Mar. 9. A few summered, N. Som. resrs., and two pairs bred, Chew Valley res. (PJC). Autumn resr. totals below normal with *c.* 1,100, mid-Oct. and 1,400 (980, Cheddar), Dec. 15. Frampton Pools: 200–230, Nov.–Dec.

FERRUGINOUS DUCK *Aythya nyroca*

S. Adult male, Orchardleigh Lake, Dec. 20–28 (RMC, BR *et al.*). moved to Chew Valley res. on 29th (AHD, GPT, KEV). Record, fifth for area, accept by *Brit. Birds* Rarities Committee.

GOLDENEYE *Bucephala clangula* *See p. 494.*

G. and **S.** Frampton Pools: up to four, Jan.–Feb.; two in Mar. and one to Apr. 20; one, Nov. 9, rising to 7 on 29th but only three in Dec. **S.** totals *c.* 40, Feb.–Mar. and over 60, Apr. 14 (35, Blagdon; 26, Chew Valley); one still present, Chew Valley, May 2. Autumn records from Oct. 19, total rising to at least 23 by Nov. 21 and *c.* 30 by end Dec.

LONG-TAILED DUCK *Clangula hyemalis* *See p. 494.*

COMMON SCOTER *Melanitta nigra*

G. Male, Frampton on Severn, June 23, 27 (RKB).

S. Nine off Sand Point, Jan. 9 (PC), eight on 14th (BR) and one dead on beach, Mar. 24 (RA). One, Chew Valley res., Apr. 10 (BR). Male in Channel, Sept. 29 (S) and three ♀♀ or imms., off Brean Down, same day (BR); one, Sand Point, Oct. 27 and two, Nov. 24 (TB); party of 20 flying W. off Clevedon, Nov. 6 (WBC, PH) and female, Dec. 9 (BR).

RED-BREASTED MERGANSER *Mergus serrator*

S. Three, Blagdon res., Feb. 11–Mar. 9 and one on 10th (PJC, MAW *et al.*). Chew Valley res.: two, Mar. 4 (BR); three, Apr. 12 (RH); two, Nov. 10–17 (AJH, NTL *et al.*); parties of four, Nov. 24 (GS *et al.*) and eight (possibly another three present), Dec. 28 (RA, TB)—the largest number ever recorded in N. Somerset.

GOOSANDER *Mergus merganser*

G. Single ♂, Frampton Pools, Dec. 29 (KJG).

S. Reservoirs: up to three, Chew Valley, Jan.–Apr. 8 (GBB, MLD *et al.*); one, Chew Magna, Jan. 14 (RJP) and two, Blagdon, Mar. 31 (RJL *et al.*)—probably the Chew Valley birds; male, Cheddar, Nov. 28—Dec. 15 (HH *et al.*); 'brownhead', Blagdon, Dec. 1–19 (TRC, SJM) and Cheddar, Dec. 31 (CRB); two, Chew Valley, Dec. 14 (RA); ten, Dec. 17 (GLB); 25 on 29th and 19 on 30th (BR).

SMEW *Mergus albellus*

S. Male, Chew Valley res., Jan. 14–Feb. 25 (SHGB, HWN *et al.*), but two, Feb. 4 (RSH). Male, Blagdon res., Feb. 15 (BR, WLR).

NORTH AMERICAN RUDDY DUCK *Oxyura jamaicensis*

G. Full-winged birds from W.T. visit Frampton Pools.

S. Regularly seen off reed-beds, Chew Valley res., Jan.–Apr. with max. of 25, Feb. 27 (GLB) but no breeding records; again noted, Aug. 17 to end year and also at Blagdon during Dec., with total, both resrs., of 31, Dec. 19 (PLG, DW *et al.*).

SHELDUCK *Tadorna tadorna*

G. Max. Spring count, New Grounds, 255, June 9 (TDE, DIMW).

S. Breeding season survey, R. Avon–Birneck I., gave max., June 16, of 161 pulli; more hatched later—small pulli seen well into Aug.; pair bred, Nailsea Moor (HRH). Pair hatched 13 pulli, Chew Valley res. (GPT *et al.*).

GREYLAG GOOSE *Anser anser*

G. Full-winged birds from W.T. visit Frampton Pools.

S. Records of birds presumed wild: one, Cheddar res., May 9 (BR), and five, R. Kenn estuary, Dec. 15 (KEV).

WHITE-FRONTED GOOSE *Anser albifrons*

G. New Grounds: rise from *c.* 2,800 at end of 1967 to 4,200 by mid-Jan., 5,450 on 24th, and record peak of 6,700 on Feb. 17; departures rapid—5,000, March 3, fell to half next day and to 630 on 5th, with one bird remaining on 11th. Autumn: slow rise from 10, Oct. 27, to 114, Dec. 9, then large and early influx to 690 on 11th, to 3,000 before Christmas, and 3,900 on 28th (WT). Large groups noted as far inland as Coaley, Leonard Stanley and Frocester in December (TDE).

S. Sand Point: 38 in two parties, Jan. 10 and 11, Feb. 21 (TB). Stoke Moor: 12 on flooded fields, Jan. 14 (TRJ, ADL). Three, Woodspring Bay, Nov. 6 (NTL); 28, in small parties, Chew Valley res., Dec. 30 (BR).

LESSER WHITE-FRONTED GOOSE *Anser erythropus*

G. Adult with *albifrons*, New Grounds, Feb. 3–27 (WT).

BEAN GOOSE *Anser fabalis*

G. New Grounds: one of western race, *A. f. fabalis*, Jan. 26, and one of Russian race, *A. f. rossicus*, Dec. 15 to end of year; both seen among *albifrons* (WT).

PINK-FOOTED GOOSE *Anser brachyrhynchus*

G. Five, New Grounds, Jan. 24, increased to seven on 26th; birds stayed together, and were last seen, Feb. 24 (WT), 25 (GPT).

DARK-BREASTED BRENT GOOSE *Branta bernicla bernicla*

G. and **S.** First-winter bird seen, New Grounds, Dec. 28, 1967, stayed to Feb. 28 (WT). Three flying N.E., Sand Point, Jan. 10 (TB).

BARNACLE GOOSE *Branta leucopsis*

G. Adult with Whitefronts, New Grounds, Feb. 27 (WT), Mar. 3 (RMC) and one, also ad., Dec. 10 to end year (WT).

CANADA GOOSE *Branta canadensis*

G. and **S.** Frampton Pools stock: ave. *c.* 70 (nine counts, regular intervals) (N). 35, W.T., Dec. 27, probably same origin. Three, Horseshoe Bend, R. Avon, Bristol, Oct. 23 (RGT). N. Som. resrs.: two, Cheddar, Mar. 7, 8 (NTL, BR) and three, Chew Valley, Dec. 29 (GPT).

MUTE SWAN *Cygnus olor*

G. and **S.** Breeding records from Frampton Pools; in Bristol from Eastville and St. George Parks and R. Frome, St. Werburghs; Chew Valley and Blagdon resrs.; Nailsea and Kenn Moors; and Locking Pond, Weston-s-Mare.

WHOOPER SWAN *Cygnus cygnus*

G. and **S.** New Grounds: two, Jan. 22 (PS) and 9 (6 ads.) on 29th (MAO); adult, Nov. 7 to end year, joined on Dec. 14 by two ads. and a juv.; the two ads. left, but another present, Dec. 25—31st (WT). Four in flight, Clevedon—R. Yeo, Jan. 14 (KEV).

BEWICK'S SWAN *Cygnus columbianus*

G. New Grounds: over 180, Jan., Feb. with peak, 199, Jan. 22; 180, Mar. 2, but 130 on 3rd and 40 on 4th; a first-yr. bird stayed to Apr. 17; 344 individuals identified during winter '67/'68; autumn—17, Oct. 20, rising to 63 by 30th, 163 by Nov. 17, 184 by Dec. 9, 218 on 19th and 261, end year (WT).

S. Two or three, Stoke Moor, Jan. 11–28 (JAMCG, BR). Two, Sand Point, Jan. 11 and 8, Feb. 1 (TB). Reservoirs: present, Jan.–Mar., with peaks of 9, Cheddar, Mar. 22 (BR), four, Blagdon, Feb. 25 (MAW), and, at Chew Valley, 27, Jan. 21 and 17, Mar. 3

(NTL, DW *et al.*). First autumn birds—four, Cheddar res., Nov. 7 (WLR); max. counts, Chew Valley res., 12, Nov. 16 (RA, BK) and Blagdon res., 17 on Dec. 28—herd flew off towards Chew (RA). Two off Sand Point, Nov. 22 (TB).

BUZZARD *Buteo buteo* *See p. 496.*

G. Breeding season reports from New Grounds, Dursley, Wotton-u-Edge and Cromhall. Bred elsewhere nr. Wotton. Winter records from New Grounds, Wick and Frenchay, Bristol.

S. Recorded all months. Breeding proved at Bleadon, Mendip localities and nr. Bath; three young flew at one site (PJC, RMC, BR, GS). Breeding season reports of pairs or threes from Cleeve and Portbury; and of six together, S. Widcombe, July 18 (RSH). Single birds, Sand Point, Mar. 1; Mells, Mar. 16; Midford, Apr. 12; Marksbury, Apr. 26; Backwell, May 6, Aug. 23, Sept. 8; Whitchurch, May 7; Ashton Park, June 7; Nailsea, July 29; Worlebury, Nov. 1.

SPARROWHAWK *Accipiter nisus* *See p. 496.*

G. Recorded all months. Breeding season records from many localities throughout area. Breeding records (13) include nine found by intensive search in one 10-km square (AEB). Six nests gave ave. of 2.8 young reared (AEB, SB).

S. Reports for all months, incl. 40 different localities in Apr.–July—coast, resrs., most inland wooded areas, Bath and Bristol. Six breeding records and two probable.

GOSHAWK *Accipiter gentilis* *See p. 496.*

S. One, Chew Valley res., Dec. 23—seen by KEV, who refers to 'extremely large, almost Buzzard-sized raptor' resembling 'a gigantic Sparrowhawk' with prominent white under tail-coverts.

MARSH HARRIER *Circus aeruginosus*

S. One, Worlebury Hill nr. Weston-s-Mare. Oct. 6 (TRC, SJM).

HARRIER *Circus* sp.

S. One, ♀ or imm., Sand Bay, May 31 (TB)—date suggests *pygargus*. Male, either Montagu's or Hen Harrier, nr. Priddy, Oct. 20 (PJC, GS). One, Downside, Nov. 2 (RSH).

HOBBY *Falco subbuteo* *See p. 496.*

G. Single birds, New Grounds, May 7, 16, Aug. 4, Sept. 8, 9 (LPA, EEJ); Coaley, June 1 (D); Downend, July 19 (PLG); Hambrook, Aug. 5 (NJC); Wick, Bristol, Aug. 10, 19 (DRH) and Cromhall, Aug. 11 (NH, JH).

S. Pair reared one young; present, three other localities, during summer (pr. and two juvs. seen at one). Single birds: Corston, Bath, May 5 (RJL); Eaker Hill, Mendip, May 5 (RSH); Sand Point, May 14 (TB); Yeo Estuary, June 5 (TB); Bath, June 12 (RJL); Whitchurch, July 18, Sept. 25 (KEV); Long Ashton, July 26 (MAW) and Brean Down, Sept. 22 (CRB, PC, ADLE); many records, Chew Valley res., Apr. 27–Sept. 22 (RMC, AHD, DW *et al.*).

PEREGRINE *Falco peregrinus*

G. and **S.** New Grounds: ♂ first seen Sept. 25, 1967, until Apr. 9 (WT, RMC); ♀, Jan. 27, Feb. 24, Mar. 30 (KJ, DIMW) and Oct. 13–end year (AFA, JDS *et al.*). Single birds, Sand Point, Aug. 2 (TB); Bath, Sept. 6 (RJL) and St. George's Wharf, Sept. 14–end of year (WGB).

MERLIN *Falco columbarius*

G. Single birds, Frampton on Severn area: ♀, Mar. 22 (DIMW); ♀, Apr. 3 (GPT); ♂, Sept. 28 (PAR); ♂, Oct. 9 and one, Nov. 11 (TDE).

S. Single birds, Sand Bay, Jan. 3, Feb. 22, Aug. 20, Oct. 31, Nov. 10 (TB) and Dec. 28 (PJC); Whitchurch, Jan. 11 (KEV); Downside, Nov. 24 (RSH) and S. Widcombe, Dec. 28 (RSH).

KESTREL *Falco tinnunculus*

G. Detailed reports, all year, from Cromhall where pair reared two young (JH, NH). City of Bristol: nest, four young, Frenchay; other pairs bred, Avon Gorge and Shirehampton.

S. Reported all months. Breeding season records widely distributed over N. Somerset including city areas of Bath and Bristol (bred, Whitchurch). Eleven pairs reared ave. of 3·4 young.

RED-LEGGED PARTRIDGE *Alectoris rufa*

S. One or two, Sand Point, Mar.–early Aug. (RA, TB). One, Crook Peak, Apr. 15 (PAR). Two, Marksbury, Apr. 26(BR).

PARTRIDGE *Perdix perdix*

G. New Grounds: 14, Dec. 3 (LPA)—only record received.

S. Broods of 3, 6, and 9, Nailsea, July–Aug., and coveys of 17, Aug., and 12, Oct. (HRH); 10–11, Clevedon, Nov. (GPT, KEV). Noted in 17 other localities.

QUAIL *Coturnix coturnix*

G. Noted, Marshfield, June 16, July 25 (NC, ZMUE).

S. Single birds, Bleadon Hill, July 14 (RA); Backwell Common, July 17 (GEC); Sand Point, Aug. 1 (TB) and Burnett, Aug. 18 (CB).

WATER RAIL *Rallus aquaticus*

G. and **S.** Only summer record—Newton St. Loe, June 29, 30 (CRC, MPH, RPW). One or two seen, Jan.–Apr., Sept.–Dec., widely scattered localities, with four, New Grounds, Mar. 4 (DIMW). Chew Valley res.: 33 records of up to six, Jan.–May, Oct.–Dec., with 13, Jan. 21 (KEV) and 7+, Mar. 10 (TRC).

MOORHEN *Gallinula chloropus*

G. and **S.** Up to 75, Frampton Pools, Feb.–Mar. (TRJ, ADL, DIMW). Common and widely distributed.

COOT *Fulica atra*

G. Frampton Pools: over 400, late Sept. and Nov., and 300, Dec. 21 (AFA, TRJ, ADL).

S. Widespread breeding records. Reservoir counts: Blagdon—up to 600, Jan.–Apr. 21 and up to 400, Sept. 15 to end year; Cheddar—1,300–1,500, Jan.–Feb. 11, then fall to 850, Mar. 8, and 40 or fewer, Apr. 10–May 9; six, Aug. 4, rising to 300 on 24th, 1,000 by early Oct., and 1,500–2,300, Oct. 31 to end year; Chew Valley—481, Mar. 17 and 435, Oct. 12; Barrow Gurney—122, Jan. 13; 125, Sept. 2, and 50–60, Nov., Dec. (many observers).

OYSTERCATCHER *Haematopus ostralegus*

G. and **S.** Present all months with max., Weston Bay, 92, Jan. 20 (WLR) and 160, Sept. 21 (RA). Max., New Grounds, five, Oct. 8 (LPA). Up to six, resrs., Feb. and Apr. 6–Oct. 23.

LAPWING *Vanellus vanellus*

G. and **S.** Breeding or breeding season records from Cromhall, Clapton, Walton and Clevedon Moors, Woodspring Bay, Kewstoke, Hewish, and Blagdon and Chew Valley resrs.

RINGED PLOVER *Charadrius hiaticula*

G. and **S.** Up to 40, coast, Jan.–Mar. 2. Passages, Apr. 15–June 4 and July 26–Sept. 21, with peaks of 600, Apr. 28 and Aug. 18, New Grounds, and 400, May 26 and Aug. 18, Sand Bay area. One or two, resrs., Mar. 17–May 17, and up to 20, Aug. 4–Sept. 30; single birds, Cheddar, Dec. 1, 10.

LITTLE RINGED PLOVER *Charadrius dubius*

S. One, Cheddar res., Apr. 10–20 (JAMCG, BR). One, Sand Bay, July 18 (TB).

GREY PLOVER *Charadrius squatarola*

G. Six, New Grounds, May 25 (DIMW) and up to three to June 11, then one or two, Sept. 21–Oct. 29 (LPA, who comments, 'scarce on Estuary in 1968'). One in summer plumage, Chittening, Aug. 17 (NTL).

S. Up to three, Sand Bay, Jan. 23–June 6 and Oct. 9–Nov. 27 (TB). One, Chew Valley, res., Aug. 7 (KEV).

GOLDEN PLOVER *Charadrius apricarius*

G. Up to 40, New Grounds, Jan., Feb., and Dec. 29; up to eight, Mar., May and Aug.–Dec.; 75, Yate, Feb. 24; *c.* 250 to S.W. over E. Bristol, Dec. 25; 50, Berkeley, Dec. 28.

S. Increase to pre-1967 numbers. Noted on coast, Jan.–Apr. 19 and Aug. 1–Dec., with up to 350, Weston Bay area, Feb. and Oct., but 1,100, Nov. 23 (RA). Inland: 100, Marksbury, Jan. 6 and 50, Nov. 19; up to 75, old airport, Bristol, Nov. and Dec.; up to 80, Chew Valley res., Jan. and Nov.–Dec., but few other resr. records, none over 10.

TURNSTONE *Arenaria interpres*

G. and **S.** Chittening: *c.* 100, Jan.–mid. Feb., then steady rise to 500, May 9 and fall to 10, June 8; 100–150, Aug. 3–Dec., with 300, Aug. 24 and 250, Oct. 27 (NTL). Elsewhere on coast, present all months (max. count, 20). Single birds, Cheddar res., May, Aug., Oct. (RMC, BR *et al.*).

COMMON SNIPE *Gallinago See p. 494.*

G. and **S.** 50 reports, all months. Largest counts 100, Frampton Pools, Oct. 27 and 223, Axe Estuary, Dec. 1. Breeding season records for Stoke, Hillsea, Kenn and Walton Moors, Kewstoke and Chelvey.

JACK SNIPE *Lymnocryptes minimus*

G. and **S.** 28 reports, Jan.–Apr. 14, Aug. 25–Dec., all of single birds except three, Chew Valley res., Nov. 24 (F), two there on 30th (RA) and two, Stoke Moor, Dec. 18 (BR). One recovered, Chew Valley res., Jan., ringed in Finland, May 15, 1967 (C).

WOODCOCK *Scolopax rusticola*

Five reports (9 in 1967, 19 in 1966) of one or two, Jan.–May: **S.**—Weston Woods (TB), Leigh Woods (GBB), Portbury Marsh (NTL); **G.**—Michaelwood (AEB, D). Several reported shot, Marshfield area (HJE).

CURLEW *Numenius arquata*

G. and **S.** Pattern as in 1967 but autumn numbers higher: over 200, New Grounds, June 30–Aug. 16 (400–500, July 16–Aug. 12 —LPA, DIMW); 150–200, Chittening and Yeo Estuary, Aug. (AHD, NTL); 350, Axe Estuary, Dec. 26 (RA).

WHIMBREL *Numenius phaeopus*

G. 24 reports, New Grounds, Mar. 24–May 25 with max., 21, Apr. 28; and Aug. 11–Sept. 28, with max., 5, Aug. 18. Chittening: 11, May 9 and one, Aug. 10 (NTL).

S. 22 reports, Apr. 21–May 26—with max., 65, Woodspring Bay, May 3 (RA)—and July 21–Oct. 6, with max., 26, same place, July 28 (NTL). One, Sand Bay, on late date of Nov. 10 (RA).

BLACK-TAILED GODWIT *Limosa limosa*

G. 33 reports. Up to four, New Grounds, Mar. 20–Apr. 27 and up to 10, June 8–Sept. 28. Two, Chittening, Sept. 22.

S. Six, Weston Bay, Mar. 17; four, Brean Down, Apr. 2; three, Blagdon res., Apr. 13. Six reports, Aug. 11–Nov. 23, all from Sand and Weston Bays, with max., 18, Oct. 26–very low numbers for N. Somerset.

BAR-TAILED GODWIT *Limosa lapponica*

G. New Grounds: 33 reports of up to six, Feb. 10–Sept. 22, but up to 11, Mar. 25–June 9, and 21–33, Apr. 29, 30 (LPA). Chittening: 11, Apr. 13 and one on 15th.

S. Weston and Sand Bays: 23 reports, Jan. 5–Apr. 2, with max., 10, Jan. 20 (PC); and Aug. 9–Dec. 15, with max., 11, Aug. 9 (RA).

GREEN SANDPIPER *Tringa ochropus*

G. and **S.** Pattern as in 1967; 60 reports, Jan.–Dec., coast and scattered inland areas, of one or two, with up to seven, July 9–Sept. 13, but 22, Yeo Estuary, Aug. 26 (PLG).

WOOD SANDPIPER. *Tringa glareola*

Single birds, New Grounds (**G.**), Sept. 3 (LPA), and Chew Valley res. (**S.**), Aug. 11 (TRC) and 23rd (CRB, PC).

COMMON SANDPIPER *Tringa hypoleucos*

G. and **S.** Coastal records (29) of one or two, Jan.–May 11 and up to five, June 27–Dec., with 31, R. Avon, Bristol, Aug. 11 (AHD) and 16, Sept. 8 (TRC); and 12, Clevedon, Oct. 9 (DCJ). Reports (56) from Barrow Gurney, Cheddar and Chew Valley resrs. of up to 9, Apr. 2–May 11 and up to 14, June 29–Nov. 24. One, Blagdon res., Apr. 15 (RA) and three, Sept. 11 (TRJ, ADL).

REDSHANK *Tringa totanus*

G. and **S.** Pattern as in 1967 but autumn passage larger. Up to 100, Chittening and Sand Bay, Jan.–Mar. and Sept.–Dec., and up to 370, July 20–Sept. 1; 60+, New Grounds, Sept. 8 (LPA). Breeding records, Portbury Wharf (SB), Clevedon–R. Yeo (JFB, PLG) and Woodspring Bay (RA, SMT). 59 reports.

SPOTTED REDSHANK *Tringa erythropus*

G. New Grounds (43 reports): single birds, Feb. 28–Mar. 28; present, June 18–Oct. 12, with 24–30, Aug. 24–Sept. 23.

S. One, Sand Bay, Feb. 20. Reports (13, incl. 3 from Chew Valley res.) of up to three, July 24–Sept. 28.

GREENSHANK *Tringa nebularia*

G. and **S.** One or two (rarely three), New Grounds, coast and resrs., Feb. 3–May 25 and June 25–Nov. 9, but up to five, New Grounds, June 25–Sept. 6, with 18, Aug. 3 and 9, Sept. 4 (LPA).

KNOT *Calidris canutus*

G. and **S.** Only counts over *c.* 60: 250, Weston Bay, Nov. 16 (RA); and 120, Sand Bay, Nov. 16 and Dec. 13 (TB). One, Stoke Moor, Jan. 22 and one, Cheddar res., Sept. 16 (BR).

PURPLE SANDPIPER *Calidris maritima*

G. Three, Severn Beach, Dec. 10 (RGT).

LITTLE STINT *Calidris minuta*

G. and **S.** Three, Sand Bay, Jan. 30 (TB); six, New Grounds, May 26 (DIMW). One or two, New Grounds and Sand Bay, Aug. 11–Dec. 10 with four, Sand Bay, Sept. 9 (RA) and 43, New Grounds, Nov. 2 and 7 on 3rd (LPA). One, Chew Valley res., Sept. 28 (NC).

BAIRD'S SANDPIPER *Calidris bairdii* *See p. 493.*

DUNLIN *Calidris alpina*

Present all months. Max. counts: **G.**.—1,500, New Grounds, Mar. 14 (TDE, DIMW) and 1,500–2,000, Chittening, Oct. 27–Dec. 27 (NTL); **S.**—6,000, Sand Bay, Jan. 13 and 4,000, Nov. 12 (TB).

CURLEW SANDPIPER *Calidris testacea*

G. New Grounds: one, May 12 (LPA) and one, Sept. 28 (RMC, TRC).

S. Sand Bay: two, Aug. 9 (RA) and three on 13th (TB).

SEMI-PALMATED SANDPIPER *Calidris pusilla*

G. One, New Grounds, Oct. 13, after S.W. gales (DIMW). Record, accepted by *Brit. Birds* Rarities Committee, is first for **G.** and for Bristol district.

Details include: intermediate in size between *schinzii* Dunlin and Little Stint also present; resembled latter in outline and character, running and feeding nervously; drab greyish-olive in general tone; short-winged; fairly prominent supercilium, more distinct behind eye; dark cheeks, whitish half-collar, greyish streaked chest; rather uniform upper-parts with one faint stripe along mantle edge; whitish under-parts; dark legs; thick-based bill with decurved tip. Seen from 100 – 50 yards, X30 telescope.

Sanderling *Crocethia alba*

G. and **S.** New Grounds (18 reports): up to six, Apr. 21–May 26; up to 33, May 28–June 30; one or two, Aug. 13–Sept. 28. Eight, Chittening, May 19 (NTL). Sand and Weston Bays: 30 reports of up to ten, Jan. 3–June 9 and July 26–Dec. 18, but 17, May 17 (TB). Up to five, Cheddar and Chew Valley resrs., May.

Ruff *Philomachus pugnax*

G. and **S.** Coast and resrs. (94 reports): up to ten, Jan. 11–May 26 and up to five, July 23–Dec. 23, but up to 17, New Grounds, Aug. 18–Nov. 1 with up to 23 in Sept. (LPA *et al.*). Stoke Moor: 22, Jan. 22 and one, July 31 (BR).

Grey Phalarope *Phalaropus fulicarius*

G. Two, New Grounds, Sept. 21 and one, 22nd (DIMW), 23rd and 24th (MAO *et al.*), and 27th (GPT).

S. Many reports, Chew Valley res., where one first seen, Sept. 22 (RH, RJL, KEV *et al.*), and last seen, Oct. 5 (RA); two, Sept. 23 (GWB, TRC); details suggest three birds present in all (NJC, DW *et al.*). One, Cheddar res., Sept. 23 (CRB, PC).

Stone Curlew *Burhinus oedicnemus*

S. One flushed from stony field near edge of Weston-s-Mare airfield, Sept. 11 (PC), seen again same evening (PC, DJP).

Great Skua *Stercorarius skua*

G. and **S.** One off New Grounds, Sept. 21 (TRC, CEDS), 22 (DIMW); four past Brean Down, Sept. 29 (BR) and oiled bird Sand Bay, same day (RA). One flying N., Sand Point, Oct. 13 (TB).

Gulls *Laridae*

Censuses of N. Somerset roosts by team of 12 observers, Dec. '68/Jan. '69, gave following results:

	GBBG	LBBG	HG	CG	BHG	TOTAL
Mouth of Avon	5	25	650	125	9,000	9,800
Yeo Estuary	—	—	—	—	—	200
Axe Estuary	—	—	—	150	3,500	3,650
Steep Holm	—	—	1,500*	—	—	1,500
Chew Valley res.	10	200	3,500	5,000	15,000	23,700

*but 2,000 at roost in October.

Lesser Black-backed Gull *Larus fuscus*

S. About 300 roosting, Chew Valley res., Jan. 31–all British race–and just over 1,000, Oct. 20 (PJC).

Herring Gull/Lesser Black-backed Gull *Larus argentatus/fuscus*

S. Dead albino chick found, Steep Holm, July 15 (S). This emphasises the need for careful and complete *field* descriptions of all Iceland or Glaucous Gulls—Eds.

COMMON GULL *Larus canus*

G. 15,000–20,000 at roost, New Grounds, Mar. 2 (TDE).

GLAUCOUS GULL *Larus hyperboreus*

G. One, New Grounds, Sept. 24 (DIMW)—an early date.

MEDITERRANEAN BLACK-HEADED GULL *Larus melanocephalus*

S. First-winter bird, reported by GPT and KEV, flying past Clevedon, Nov. 17. Single immatures also reported, Chew Valley res., 2.7.67 (AHD) and Yeo Estuary, 15.10.67 (KEV).

BONAPARTE'S GULL *Larus philadelphia*

S. Juvenile watched at close range, Cheddar res., Aug. 28 (GWB, TRC and PLG). Record—first for County and for Bristol area—accepted by *Brit. Birds* Rarities Committee.

The observers' very detailed notes stress that superficially the bird resembled a juv. Black-headed Gull swimming nearby but was of slighter build—*c.* three-quarters size—and further differed in having an entirely black bill, completely white underwing and thinner dark terminal tail band; wings narrower and relatively longer with continuous dark and gradually tapering area on trailing edge, broadest on secondaries; flight more tern-like, with quick shallow wing-beats recalling Little Tern's. Bird attacked and pecked on nape by juv. Kittiwake, also mobbed by Black-headed Gulls.

LITTLE GULL *Larus minutus*

G. and **S.** Ad., W.T. enclosures, Jan. 9 (SC, CM); imm. over estuary, New Grounds, Mar. 25, 26 (LPA); one, Apr. 28 (DIMW) and two imms., Sept. 5 (LPA). Influx of imms., N. Som. resrs., Aug. 11–Sept. 29: Chew—one, Aug. 11, two on 23rd, three, Sept. 2, one on 14th and 21st and four on 28th; Barrow Gurney—one, Aug. 23–25; Cheddar—one, Aug. 29, Sept. 22–29; Blagdon—one, Aug. 31 (CRB, RSH, ADL, HWN *et al.*).

BLACK-HEADED GULL *Larus ridibundus*

S. One found long dead, Chew Valley res., May 16, ringed Braackman-polder, Zeeland, Netherlands, 8.6.66.

KITTIWAKE *Rissa tridactyla*

G. Large numbers off New Grounds—100–120, Mar. 17 (RKB, KJG) and 100, Apr. 1 (LPA). One, same place, May 26 (DIMW) and imm., Frampton on Severn, Nov. 3 (JRH).

S. Single birds, Weston Bay, May 17 (PC); Cheddar res., Mar. 22–31, and one dead on 26th (HWN); Chew Valley res., Apr. 19, 22 (BR). Forty to N.E., Sand Point, May 19 (RA). Single imms., Chew Valley res., July 24 and Cheddar res., Aug. 14–30 (but two to four, 24th–31st), Sept. 22, 23 and Nov. 7 (PLG, RH, WLR *et al.*), and ad., Sept. 17 (BR). Five to N.E., Sand Point, Sept. 23 (RA) and single ad., Brean Down on 29th (BR).

BLACK TERN *Chlidonias niger*

G. and **S.** Spring passage, Apr. 21–May 9: small numbers—max. 16, Chew Valley res., on 8th. One, New Grounds, June 8. Autumn passage, July 23–Oct. 21: most records of under five birds but 12, Chew Valley, Aug. 22, 50 on 23rd, 14 on 24th and 10 on 25th (CRB, PC, PLG, DW *et al.*).

WHITE-WINGED BLACK TERN *Chlidonias leucopterus* *See p. 495.*

S. Single juveniles, Cheddar res., Aug. 27–Sept. 8 (AMR, MAW *et al.*), and 29th (JAMCG). Records, fifth and sixth for area, accepted by *Brit. Birds* Rarities Committee—cf. *Proc. B.N.S.*, 1967, p. 381.

COMMON TERN *Sterna hirundo* ARCTIC TERN *Sterna macrura*

G. and **S.** Spring records, Apr. 17–June 9; autumn passage, June 29–Oct. 20. Numbers generally low but small influxes:

	Aug. 20	22	23	Sept. 19	20	21	22	23
Barrow Gurney	—	—	25		—	—	—	—
Blagdon res.	—	—	—	—	—	2	2	10
Cheddar res.	13	—	12	—	—	12	6	12
Chew Valley res.	—	10	8	12	—	—	4	—
Weston Bay	—	—	—	—	6	—	—	—

ROSEATE TERN *Sterna dougallii*

G. and **S.** Single birds over estuary, Frampton-on-Severn, Sept. 28 (RMC, TRC, BK) and Cheddar res. on 29th (RH, RJL). Detailed descriptions received.

LITTLE TERN *Sterna albifrons*

G. Six off New Grounds, Apr. 21 and three, May 25 (DIMW).

S. One, Chew Valley res., July 23 (PC).

SANDWICH TERN *Sterna sandvicensis*

G. One, Frampton Pools, Apr. 21, 27 (DIMW), Sept. 4 (TDE).

S. Five flying N.E., Sand Point, May 19 and two, Axe Est., Aug. 1 (RA). Adult and juv., Cheddar res., Aug. 30 (HH, BR) and three, Sand Bay, Sept. 17 (RB).

GUILLEMOT *Uria aalge*

S. One, Sand Point, Sept. (TB).

STOCK DOVE *Columba oenas*

G. and **S.** Flocks of 60, Chew Valley res., Feb. 25 (PJC, MAW) and 33, Kingscote, Mar. (D); 27 breeding season records.

WOODPIGEON *Columba palumbus*

S. Flock of 1,250, Velvet Bottom, Mendip, Nov. 21 (WLR).

TURTLE DOVE *Streptopelia turtur*

G. and **S.** Forty-four records; earliest, Woodmanscote, Apr. 25 (TPW); 100+, Frampton Pools, June 2 (TDE).

CUCKOO *Cuculus canorus* *See p. 497.*

G. and **S.** Some 70 records of adults and 6 of juvs.; some evidence of local scarcity but data inadequate to define numbers accurately.

BARN OWL *Tyto alba* *See p. 496.*

G. One nr. Iron Acton, July 14, 1967 (BJG). No 1968 records.

S. Two, Chew Valley res., Jan. 7 (RH, RJL) then single birds, several dates, Jan. 12–Mar. 16, and Dec. 8 (HWN *et al.*). Single birds, Redhill, Jan. 20, Feb. 3 (JEC, GFGH); Chew Stoke, Mar. 8, June 12 (DW); Stratton Moor, Mar. 23 (RSH); Hunstrete, July 5 (NTL), also one dead on road, Apr. 12 (PJC); nr. Wells, May 12 (BR), Oct. 14 (GAF) and Nov. 3 (BR); Nailsea, June 20 (HRH); Rickford, June 20 (DW)—one dead there later; and Easton-in-Gordano, Nov. 30 (WGB). Pellets found at Cheddar, Chew Valley res., Hinton Blewett, Draycott and Hunstrete (TBS).

LITTLE OWL *Athene noctua*

G. and **S.** Reported from 43 localities, mainly coastal or lowland; breeding confirmed in six. City of Bristol: present Henleaze, Apr. 6 (JGP) and Horfield, June 30 (TRJ).

TAWNY OWL *Strix aluco* *See p. 496.*

G. and **S.** Bristol records from Shirehampton, Westbury, Redland and Clifton. Reported from 41 other localities (4 in **G.**) throughout area.

SHORT-EARED OWL *Asio flammeus*

G. and **S.** Single birds, New Grounds, Apr. 2 (DIMW); Chittening, Nov. 24 (NTL) and Stoke Moor, Nov. 20 (BR).

NIGHTJAR *Caprimulgus europaeus*

S. Single birds seen or heard, Backwell Hill, Brockley Combe, Cheddar Wood and Dolebury Warren (GEC, GAF, MPH, RDS) and up to six, Blackdown, Mendip (CRB, PC), May 30–July 6.

KINGFISHER *Alcedo atthis*

G. Bred, R. Frome, Eastville, Bristol and possibly nearby at Frenchay (SB, BLK), and on R. Boyd, Wick (PLG, DRH).

S. 55 records, all months, from eight rivers, streams and reservoirs (21 observers).

GREEN WOODPECKER *Picus viridis*

Few records from **G.**—Sheperdine, Whitcliff Park, Wick and, in Bristol, Clifton, Sea Mills, Shirehampton and Stapleton. About 70 **S.** records for all months and widespread areas.

GREAT SPOTTED WOODPECKER *Dendrocopos major*

Only **G.** records: bred, Cromhall (JH), Oakford (RMC), and Coombe Dingle, Bristol (BLK); many other City records, incl. 4 pairs present, breeding season, Eastville and Fishponds. Some 50 records from **S.**, all months, throughout area; many breeding records or reports of juvs.; several regularly visiting gardens and bird tables.

LESSER SPOTTED WOODPECKER *Dendrocopos minor*

G. Single birds, Wick, Apr. 10 (DRH), Filton, Aug. 22 (RA) and Slimbridge, Dec. 21 (GPT). Pair, Little Avon, Kingswood, Mar. 31 (TPW). Bristol: One, Badock's Wood, Henleaze, Apr. 6 (RGP); pairs, breeding season, Shirehampton, Fishponds, Stapleton, Snuff Mills, Frenchay (BA, SB, BLK *et al.*)—bred at last three.

S. 33 records, mostly single birds, including breeding season reports from Blagdon and Chew Valley resrs., Saltford, Newton St. Loe, Portishead, Backwell, Clevedon and Downside.

WRYNECK *Jynx torquilla*

S. One, Crook Peak, Sept. 22 (NC, AMR).

WOODLARK *Lullula arborea*

S. Two, Sand Point, Feb. 22 (DJP).

SAND MARTIN *Riparia riparia* *See p. 494.*

G. and **S.** Bred in wall drains, Keynsham (KT), Parson Street (Bristol) and Midford Stations (CG, BATH), and probably at St. Werburgh's (Bristol) (BLK) and Pensford (JAMCG).

NUTCRACKER *Nucifraga caryocatactes* *See p. 495.*

S. One, Portishead (Power Station area), Sept. 11 (SEH).

Size of Jackdaw. Crown brown; shoulders, throat and breast dark, spotted white. Wings, bill and tarsi black; tail black with white tips.

RAVEN *Corvus corax*

G. Single birds, New Grounds, Feb. 17, Apr. 7 (LPA, DIMW). One, North Nibley, mobbing Buzzard, June 6 (MAO).

S. Up to four, Brean Down area, all year, where two broods reared (RA, SB *et al.*). Two, Charterhouse, Apr. 13 (TBS), Cheddar Gorge, Apr. 20 (HRHL) and Tickenham Hill, Aug. 25 (TRJ, ADL). Single birds, Ebbor Gorge, May 6 (HRHL) and 18th (JR), Shipham. Aug. 10 and Oct. 1 (TBS) and Nailsea, Aug. 11 and Sept. 28 (HRH),

WILLOW TIT *Parus montanus*

G. Two, Frampton Pools, Dec. 14 (TDE).

S. Two, Walton Moor, Apr. 15 (PJC, GS); single birds, Fernhill Woods, June 2 (RSH), and East Harptree, July 31 (GLB).

BEARDED TIT *Panurus biarmicus*

G. Up to five, Frampton Pools, Dec. 14–29 (TDE, KJG, GCL).

DIPPER *Cinclus cinclus* *See p. 498.*

G. Bred, R. Boyd (Wick) and R. Frome, Bristol (SB, DRH).

S. Pairs, Midford and Wellow Brooks, Jan.–Feb. (RMC, RH).

RING OUZEL *Turdus torquatus*

G. Up to seven, Cam Long Down, Apr. 7, 20, 21 (D).

S. Five, Crook Peak, Mar. 31 (RA); four, Brean Down, Apr. 15 (MLD, PAR). One or two, Clevedon and Sand Point, Mar., Sept. (TB, AJT).

WHEATEAR *Oenanthe oenanthe*

G. Up to six, Filton, Mar. 20–May 16 and July 18–Sept. 24 (RA). One or two, New Grounds, Mar. 24, Frampton on Severn, Aug. 25 and Northwick Oaze, Sept. 2 (TRC, RKG, DCJ).

S. Twelve, Brean Down, Apr. 2 (TRJ, ADL). Up to six, coast, resrs. and Mendip, Mar. 6–Apr. 2 and July 6–Nov. 3 (26 reports).

STONECHAT *Saxicola torquata*

G. and **S.** Bred, Chittening, Brean Down, Wavering Down and Old Airport, Whitchurch (Bristol) (RA, PGF, WLR, TBS). One or two, Jan.–June and Sept.–Dec., Frampton Pools, Filton, Felton Common, Nailsea Moor, Gordano Valley, Clevedon coast, Sand Bay and Cheddar and Chew Valley resrs. (32 reports).

WHINCHAT *Saxicola rubetra*

G. Up to three, New Grounds, Dursley, Bagpath, Olveston, Compton Greenfield, Filton and Shirehampton, Apr. 21–Sept. 17.

S. Bred, Nailsea Moor (HRH, MVT, GW). Reports (22) of one or two from coasts, resrs. and Mendip, Apr. 10–Sept. 7; seven, Chew Valley res., July 28.

REDSTART *Phoenicurus phoenicurus*

Bred, **S.**: Goblin Combe and West Horrington (PLG, BR). Reports (24) of up to four, Mar. 30–Sept. 17, from: **G.**—Filton, Shirehampton Park and Durdham Down (Bristol); and **S.**—Ashton Hill Plantation, Walton Moor, Sand Bay, Brean Down, Barrow Gurney and Chew Valley resrs., and Emborough Pond.

BLACK REDSTART *Phoenicurus ochrurus*

S. Single birds, Nailsea, Aug. 16 (SM, WAW), Keynsham, Oct. 21 (EMPr), Clevedon, Nov. 24 (HMC), Kingston Seymour, Nov. 29 (BR), Sand Point, Dec. 13, 29 (TB, RGT) and Brean Down, Dec. 21 (TBS). Two, ♀♀, Cheddar res., Oct. 31 (BR).

NIGHTINGALE *Luscinia megarhynchos*

Breeding proved, Hanham Woods (Bristol) and Oakford nr. St. Catherine (**G.**) and Midford (**S.**) Reports of singing ♂♂ Apr. 20–June 5 from: **G.**—Leonard Stanley, Littleton upon Severn and Inglestone Common; and **S.**—Brislington (Bristol), Sandford and Shipham.

GRASSHOPPER WARBLER *Locustella naevia*

G. and **S.** Reports (45), Apr. 16–Sept. 7, of up to 7 singing ♂♂ from 27 localities. City of Bristol: bred, Frenchay (SB).

REED WARBLER *Acrocephalus scirpaceus*

Records from Frampton on Severn and Stoke Brook, Filton (**G.**) and from Chew Valley res., Walton Moor and Weston-s-Mare (**S.**)

BLACKCAP *Sylvia atricapilla*

Winter records: four, Clevedon, Feb.–Mar. (JFB) and one, ♀, Clifton Down, Bristol, Dec. 31 (RLB).

CHIFFCHAFF *Phylloscopus collybita*

Winter records, probably this species, from: **G.**—Frampton on Severn, Feb. 16 (DIMW) and Dec. 15–31 (KJG *et al.*); and **S.**—Weston-s-Mare, Jan. 6 (PC) and Midford, Jan. 7 (RMC).

WOOD WARBLER *Phylloscopus sibilatrix*

G. and **S.** Bred, Oldbury Court (Bristol) and Leigh Woods (SB, PJC). Breeding season records (23) of up to five, from Frocester, Dursley, Clifton Down (Bristol), Ashton Park, Norton's Wood (Clevedon), Goblin Combe, Weston Woods, Ebbor Gorge, West Horrington, Chewton Mendip and Emborough Pond.

GOLDCREST *Regulus regulus*

S. At least 25, Weston Woods, Jan. 20, Feb. 24 (CRB).

FIRECREST *Regulus ignicapillus*

G. and **S.** Details supplied of single birds, Chew Valley res., Jan. 1 (KEV), Durdham Down (Bristol), Mar. 22 (NTL) and Frampton Pools, Nov. 23 with at least two on 24th (TDE).

RICHARD'S PIPIT *Anthus richardi*

S. At least two, Yeo Estuary, Oct. 20; single birds, same area, Nov. 4, 10 and 24 (SBa, TRC, KDS). Record, fourth for district—cf. *Proc. B.N.S.* 1960, p.134—accepted by *Brit. Birds* Rarities Committee.

TREE PIPIT *Anthus trivialis*

G. and **S.** Reports (39) from 21 localities, Mar. 30–Sept. 24.

ROCK PIPIT *Anthus spinoletta petrosus*

S. Reservoirs—one or two, Cheddar, Feb. 6–Mar. 10 and Oct. 15–Nov. 20 (RJL, BR); one, Chew Valley, Mar. 13 (PJC) and Barrow Gurney, Oct. 15 (BR).

WATER PIPIT *Anthus spinoletta spinoletta*

S. Up to three, Cheddar and Chew Valley resrs., Jan. 12–Apr. 10 and Oct. 31–Dec. 29 (31 reports).

PIED WAGTAIL *Motacilla alba yarellii*

Roosts of at least 60, New Grounds (**G.**), Mar. 5 (TDE) and of 50, Rowberrow Warren (**S.**), Sept. 29 (PFB).

WHITE WAGTAIL *Motacilla alba alba*

G. Two, Frampton on Severn, Apr. 10 (TDE), and New Grounds, Apr. 19 (DIMW).

S. Up to three, Sand Bay and Cheddar and Chew Valley resrs., Apr. 4–May 9 (RA, PLG, JAMCG); five, Chew Valley, Sept. 21 and four, Weston beach, Sept. 25 (RA).

BLUE-HEADED WAGTAIL *Motacilla flava flava*

S. Chew Valley res.: one a ♂, April 4; pair, May 5; ♂♀♀, May 9; and single birds, probably this species, May 5 and July 30 (KEV *et al.*).—full details supplied.

HAWFINCH *Coccothraustes coccothraustes*

G. and **S.** City of Bristol: four, Clifton Down, Mar. 3 (HRHL); five, Shirehampton Park, May 14, 15 (BA). Up to three, Combe Down (Bath), Mar. 28–31 and May 4; Midford, Apr. 28 and Oct. 12, and Orchardleigh, Dec. 27 (RMC, RH, JHO, RJL).

SISKIN *Carduelis spinus*

G. One, New Grounds, Apr. 7 (DIMW). Two, Durdham Down (Bristol), Dec. 12 (TBS). Six, Frampton Pools, Dec. 25 (JLMP).

S. 50, Hunstrete Lake, Oct. 26 (NTL). Reports, Jan., Feb., and Sept.–Dec., of up to 22, Velvet Bottom, Chew Magna, Orchardleigh Lake, coasts and resrs. (10 observers).

REDPOLL *Carduelis flammea*

G. and **S.** Single birds, and parties of up to 30, reported from 15 inland and coastal localities, Jan.–May 19 and Sept. 29–Dec.

SERIN *Serinus canarius*

G. One, New Grounds, Apr. 6 (DIMW). Record—first for County—accepted by *Brit. Birds* Rarities Committee.

BRAMBLING *Fringilla montifringilla*

G. and **S.** Reports (47) of up to 50 from 21 localities, Jan.–Apr. 5 and Oct. 16–Dec.; 100, Claverton Down, Bath, Feb. 3 (RMC).

CORN BUNTING *Emberiza calandra*

G. Bred, Pucklechurch (SB). Count of 77 singing ♂♂, Tormarton–N. Wraxall–Marshfield area, June 16, and 66, July 9 (NJC). One or two reported, Frampton on Severn, New Grounds, Kingscote, Dunkirk, Little Badminton, W. Littleton, Dyrham, Freezing Hill and Mangotsfield, Mar. 25–Aug. 12 (LPA, PLG, DRH *et al.*).

S. Single birds and up to seven reported, Sand Bay, Bleadon Level, Draycott, Westbury-sub-Mendip, E. Horrington, Chewton Mendip, Green Ore, Priddy Pool, Yoxter, Dundry Hill and Lansdown, Jan. 14–Aug. 31 (DRH, TBS, MAW *et al.*).

CIRL BUNTING *Emberiza cirlus* *See p. 498.*

Breeding season records: **G.**—Horseshoe Bend, R. Avon (Bristol); and **S.**—Sand Point, Compton Bishop, Cheddar res. and Blackdown, Mendip (BA, ADL, SJM *et al.*).

LAPLAND BUNTING *Calcarius lapponicus*

G. One heard, New Grounds, Sept. 21 (DIMW).

S. One near Clevedon, Dec. 26 (GPT)—details received.

SNOW BUNTING *Plectrophenax nivalis*

G. and **S.** Up to six, New Grounds, St. George's Wharf, Clevedon, Yeo Estuary, Sand Bay and Weston-s-Mare, Jan.–May and Oct.–Dec. (WGB, AHD, PAR *et al.*); 27, Sand Bay, Nov. 13 (TB).

TREE SPARROW *Passer montanus*

G. and **S.** Reports of up to 15, all months, from 17 localities (14 observers) but 50, Compton Greenfield, Mar. 28 (NJC) and 120, Frampton Pools, Dec. 26th and 30 (TDE).

OTHER COMMON OR REGULARLY OCCURRING SPECIES PRESENT

(those marked * are mentioned in the Foreword).

Residents: Collared Dove*, Skylark, Carrion Crow, Rook*, Jackdaw, Magpie, Jay, Great Tit, Blue Tit, Coal Tit, Marsh Tit, Long-tailed Tit, Nuthatch, Treecreeper, Wren*, Mistle Thrush, Song Thrush, Blackbird*, Robin, Dunnock, Meadow Pipit, Grey Wagtail*, Starling, Greenfinch, Goldfinch, Linnet, Bullfinch, Chaffinch, Yellowhammer, Reed Bunting, House Sparrow.

Summer or winter visitors or passage migrants: Swift*, Swallow*, House Martin*, Fieldfare, Redwing, Sedge Warbler, Garden Warbler, Whitethroat, Lesser Whitethroat, Willow Warbler*, Spotted Flycatcher, Yellow Wagtail*.

LEPIDOPTERA NOTES BRISTOL DISTRICT, 1968

BUTTERFLIES

By A. D. R. Brown

THE butterfly season started late in 1968 due to a prolonged cold spell in the spring, but was followed by warm sunny weather in May and June, leading a somewhat wet and dull summer. Noteworthy features of the year were the large number of the Small Tortoiseshell (*Aglais urticae* L.) which emerged during the late summer and autumn, and also two sightings of the Milkweed (*Danaus plexippus* L.), a rare migrant from North America. Two other migrants, the Painted Lady (*Vanessa cardui* L.), and the Red Admiral (*Vanessa atalanta* L.), were around in good numbers during the autumn, although only one report of the Clouded Yellow (*Colias croceus* Fourc.) was received.

Contributors were: R. Angles (R.A.), G. R. Best (G.R.B.), A. D. R. Brown (A.D.R.B.), J. F. Burton (J.F.B.), D. G. Gibb (D.G.G.), Mrs. C. Graham (C.G.), Miss I. F. Gravestock (I.F.G.), D. R. Hamblett (D.R.H.), C. Hooper (C.H.), A. Kennard (A.K.), B. L. Kingston (B.L.K.), M. C. Knight (M.C.K.), K. H. Poole (K.H.P.), Miss M. Quirk (M.Q.), A. Richardson (A.R.), T. B. & M. A. Silcocks (T. & M.S.), Miss B. Smith (B.S.), D. Munro Smith (D.M.S.), D. Warden (D.W.), C. W. Wiltshire (C.W.W.), and Miss D. Withers (D.Ws.)

It is most encouraging to see a greater number of contributors than usual, but it should be made clear that, due to limited space, only the most important material can be selected for publishing. However, *all* information is gratefully received and is filled for later use.

Recordings are listed in two categories: those from Bristol and Gloucestershire (**G**) and Somerset (**S**).

Danaus plexippus L. (Milkweed)

During October, about a dozen specimens of this rare migrant from North America were observed in South-West England, and two of these were reported from the Bristol District.

G. One captured at Churchdown on Oct. 26 and presented to Gloucester Museum (A.R.).

S. One seen by E. G. Holt in his garden at Brent Knoll on Oct. 14 (per T. and M.S.).

Parage aegeria L. (Speckled Wood)

The species was again seen in reasonable numbers at its usual haunts throughout the year, although nothing in the way of variation was noted. The first records were two from Cheddar (**S.**) on Apr. 15 (T. & M.S.), and one from Saltford (**S.**) on Apr. 21 (A.K.), while the last report was that of one seen at Filton (**G.**) on Oct. 15 (R.A.).

Pararge megera L. (Wall Brown)

A marked increase in numbers generally, and was reported as being quite abundant in places during the second brood. Several new records from Gloucestershire and Bristol are most encouraging.

G. Nympsfield: abundant on Aug. 11 (M.C.K.); Charfield: single specimens on May 28, Sept. 9 & 18, 2 on Aug. 21 (M.C.K.); Almondsbury: 1 on Sept. 2 (D.G.G.); Wotton-under-Edge: 1 male on May 26 (A.D.R.B.); Wick: 1 on June 4, 2 on Sept. 1, 1 on Sept. 8 (D.R.H.); Roman Villa, Chedworth: several on Aug. 25 (C.W.W.); Haresfield: common on Aug. 18 (A.D.R.B.); Kingsweston Down: 1 on Aug. 22 (A.D.R.B.), 3 on Aug. 23 (C.W.W.); Downend: 1 in Sept. (D.M.S.); Stoke Park. Stapleton: seen on Aug. 4 & 6 (B.L.K.); Eastville: 1 in Aug. (B.L.K.).

S. Shapwick Heath: 2 on June 15 (T. & M.S.); Clevedon: 1 on May 4 (J.F.B.); Charterhouse: several on June 9 (J.F.B.); Priddy: 1 of each sex on June 1 (C.W.W.); Chew Valley Reservoir: 1 on Sept. 21 (R.A.); Brean Down: 4 on May 26 & June 4, 3 on Aug. 13, 2 on Sept. 1 (R.A.); Sand Point: seen in small numbers from May 19 to Aug. 9 (R.A. and T. & M.S.); Wick St. Lawrence: 1 on June 16 (T. & M.S.); Wain's Hill: 2 on June 8, several on June 9 (J.F.B.); Cheddar: at least 2 on June 9 (R. & M.S.).

Melanargia galathea L. (Marbled White)

The first specimens were reported on June 30, and the species again enjoyed a good year with records from several new haunts. It appears to be holding its own in many threatened localities, and has gradually built up its numbers in the last few years.

G. Stinchcombe: many freshly emerged specimens on June 30 (A.D.R.B.), several on July 13 (C.W.W.); Paradise: many on July 13 (C.W.W.); Almondsbury: 6 on Aug. 3 (D.G.G.); Haresfield: a few on Aug. 18 (A.D.R.B.); Ozleworth Bottom: several on Aug. 10 (A.D.R.B.); Kingsweston Down: 6 on July 9 (R.A.), several on July 31 and Aug. 2 (A.D.R.B.).

S. Priddy: very common on July 21 (T. & M.S.), several on Aug. 4 (D.W.); Sand Point: single specimens on July 6, 14 & 21 (R.A.); Shapwick Heath: at least 3 on July 13 (T. & M.S.), 3 on July 13, 20 on July 27 (R.A.); Uphill: 5 on July 6 (R.A.); Worlebury: very common on July 21 (T. & M.S.); Dolebury Warren: 1 on July 27 (B.L.K.); Windmill Hill: 3 on July 13 (T. & M.S.); Shipham: 1 on July 20 (T. & M.S.).

Eumenis semele L. (Grayling)

This species seems to be restricted to very few localities indeed around the Bristol district, judging from the records received.

S. Sand Point: seen on July 21 & 28 (A.K.), 2 on Aug. 25 (T. & M.S.), 6 on July 21 & 28, and Aug. 4 (R.A.); Brean Down: at least 20 on Aug. 8 (T. & M.S.).

Maniola tithonus L. (Hedge Brown)

In several localities the species was observed in very large numbers, with a few ab. *transformis* and a large proportion of ab. *excessa*, some being quite extreme.

G. Charfield: single specimens on Aug. 12 & 15 (M.C.K.); Wick: 1 on July 28 and on Aug. 11 (D.R.H.); Kingsweston Down: very abundant on July 31, Aug. 2, 4 & 22 (A.D.R.B.), 6 on Aug. 28 (C.W.W.); Upper Eastville: seen during the year (B.L.K.).

S. Sand Point: seen in good numbers from July 21 to Sept. 3 (A.K. and R.A.), 2 on Sept. 8 (T. & M.S.); Shipham: single specimens on Aug. 19, 20 & 26 (T. & M.S.); Brean Down: 4 on Aug. 18, 1 on Sept. 1 (R.A.); Sandford Hill: 4 on Aug. 31 (T. & M.S.); Blagdon: several on Aug. 24 (T. & M.S.); Wavering Down: several on Aug. 5 (T. & M.S.); Draycott Moor: 1 on Aug. 10 (T. & M.S.).

Maniola jurtina L. (Meadow Brown)

Again reported in fair numbers, but fewer records received. The first specimen was seen at Shipham (**S.**) on June 18 (T. & M.S.), and the last also at Shipham on Sept. 13 (T. & M.S.).

Coenonympha pamphilus L. (Small Heath)

This species was again reported abundantly in many places, with a fine range of variation on Kingsweston Down (**G**), (A.D.R.B.).

G. Filton: seen regularly throughout the year (R.A. and C.W.W.); Inglestone Common: 2 on May 26, abundant on May 31 (A.D.R.B.); Stinchcombe: numerous on June 30 (A.D.R.B.), many on July 13 (C.W.W.), 3 on Aug. 18 (D.R.H.); Haresfield: 3 on Aug. 18 (A.D.R.B.); Paradise: many on July 13 (C.W.W.); Kingsweston Down: abundant from May to August (A.D.R.B., C.W.W. and R.A.); Henbury Golf Course: 1 on May 19 (A.D.R.B.).

S. Sand Point: small numbers seen from June 12 to Sept. 12 (A.K., T. & M.S. and R.A.); Shapwick Heath: seen on June 8 (R.A.), 1 on June 15 (T. & M.S.); Minehead: seen on June 17 (R.A.); Old Down: at least 50 on July 20 (T. & M.S.); Charterhouse: many on June 1 (C.W.W.), several on Aug. 5 (T. & M.S.); Goblin Combe: numerous on June 9 (A.D.R.B.); Worlebury: 3 on June 12 (K.H.P.), very common on July 21 (T. & M.S.); Shipham: 3 on June 9, 1 on Sept. 18 (T. & M.S.); Windmill Hill: 1 on July 13 (T. & M.S.); Uphill: 6 on July 6 (R.A.); Cheddar: at least 5 on June 9, several on July 28 (T. & M.S.); Draycott Moor: a few on Aug. 10 (T. & M.S.); Burrington Combe: seen on June 6 (K.H.P.); Sandford Hill: 2 on Aug. 31 (T. & M.S.); Walton Hill: seen on May 25 (K.H.P.); Wavering Down: 2 on Aug. 5 (T. & M.S.); Dolebury Warren: seen on June 15 (A.K.).

Aphantopus hyperanthus L. (Ringlet)

Only a limited number of records received, the species never being common, and nothing in the way of variation was noted.

G. Stinchcombe: numerous on June 30 (A.D.R.B.); Haresfield: 1 on Aug. 18 (A.D.R.B.); Ozleworth Bottom: several on Aug. 10 (A.D.R.B.); Paradise: many on July 13 (C.W.W.); Wick: 4 on Aug. 4 (D.R.H.).

S. Sand Point: seen on July 21 & 28 (A.K.); Cheddar: several on July 28 (T. & M.S.); Worlebury: 2 on Aug. 3 (R.A.); Shapwick: several on July 13 (T. & M.S.); Saltford: seen on July 27 (A.K.); Leigh Woods: seen on June 29 (A.K.); nr. Glastonbury: several on July 6 (T. & M.S.).

Argynnis selene Schiff. (Small Pearl-Bordered Fritillary)

Two records only of this local species.

S. Goblin Combe: plentiful on June 9 (A.D.R.B.); Dolebury Warren: seen on June 15 (A.K.).

Argynnis euphrosyne L. (Pearl-Bordered Fritillary)

G. Inglestone Common: 3 on June 3 (D.G.G.).

S. Goblin Combe: 5 on June 9 (A.D.R.B.).

Argynnis aglaia L. (Dark Green Fritillary)

Unlike the other Argynnids, this species appears to be keeping up its numbers wherever it occurs.

G. Stinchcombe: numerous on June 30 (A.D.R.B.), many of each sex on July 13 (C.W.W.);

S. Sand Point: 1 on Aug. 4 & 11 (R.A.); Dolebury Warren: 1 on July 27 (B.L.K.).

Argynnis paphia L. (Silver Washed Fritillary)

S. Shipham: 1 on Sept. 9 & 11 (T. & M.S.).

Euphydryas aurinia Rott. (Marsh Fritillary)

The species appears to be approaching a peak year in the usual colonies in Gloucestershire and Somerset, with immense numbers having been reported. Several interesting aberrations were bred from stock collected at these localities.

G. Wickwar: larvae abundant on Apr. 17 (A.D.R.B. and D.G.G.), plentiful on May 26 & 31 (A.D.R.B.), many on June 3 (D.G.G.).

S. Charterhouse: larvae abundant on Apr. 21 (A.D.R.B.), exceedingly abundant on June 1 & 2 (C.W.W.), fairly numerous on June 9 (J.F.B.); Shapwick Heath: 4 on June 15 (T. & M.S.).

Vanessa atalanta L. (Red Admiral)

G. Wick: 4 on Aug. 18, 2 on Sept. 19, 2 on Oct. 4, 3 on Oct. 12, 1 on Nov. 3 (D.R.H.); Charfield: single specimens on Sept. 19, 27, 28 & 29, and Oct. 5, 6, & 10 (M.C.K.); Almondsbury: 2 in early Oct. (G.R.B.); Filton: 2 on Oct. 2, 1 on Oct. 3, 6 on Oct. 21, 1 on Oct. 22 (R.A.); Paradise: 2 on July 13 (C.W.W.); Kingsweston Down: 2 on Oct. 6 (A.D.R.B.); Bishop Sutton: a few on Sept. 28 (D.W.); Stoke Bishop: several during Sept. and Oct. (A.D.R.B.).

S. Sand Point: 4 on Sept. 8, 1 on Sept. 9, seen on Sept. 12 and Oct. 6, 13 & 20, 3 on Nov. 5 (R.A.); Brean Down: many on Oct. 6 (D.W.); Hinton Charterhouse: 2 on Oct. 6 (D. Ws.); Chew: 20 on Sept. 21 (R.A.); Clevedon: several on Oct. 6 (J.F.B.); Weston-super-Mare: seen on Nov. 9 (R.A.); Wrington: 1 on July 20 (D.Ws.).

Vanessa cardui L. (Painted Lady)

G. Paradise: 2 on July 13 (C.W.W.); Charfield: singles on Sept. 11, 12 & 18 (M.C.K.); Stoke Bishop: seen frequently during Sept. and Oct. (A.D.R.B.); Long Ashton: 1 on Oct. 13 (M.Q.); Bishop Sutton: singles on Aug. 18 & 28 (D.W.).

S. Sand Point: 3 on Sept. 8, 1 on Sept. 13, 2 on Oct. 31 (R.A.); Shipham: singles on Aug. 23, and Sept. 4, 6, 9, 18, and 2 on Sept. 13 (T. & M.S.).

Aglais urticae L. (Small Tortoiseshell)

The species was observed in profusion during the later summer and autumn, and several major aberrations were bred from collected larvae (C.W.W.). The first specimens were seen at Shipham (**S.**) (T. & M.S.) and Stoke Bishop (**G.**) (A.D.R.B.), both on Mar. 4, and the last at Charfield (**G.**) on Nov. 24 (M.C.K.).

Nymphalis io L. (Peacock)

This species too was very plentiful in 1968, the first to be seen in Frampton Cotterell (**G.**) on Mar. 4 (T. Parkes, per R.A.), and the last in Stoke Bishop (**G.**) on Oct. 28 (C.W.W.).

Polygonia c-album L. (Comma)

No apparent change in the status of this species.

G. Inglestone Common: 1 on Mar. 26 (D.G.G.), 1 on Mar. 27, plentiful on Apr. 17 (A.D.R.B.); Almondsbury: 2 on Aug. 5 (D.G.G.), 2 in early Oct. (G.R.B.); Ozleworth Bottom: several on Aug. 10 (A.D.R.B.); Charfield: singles on Mar. 27 and Sept. 18 (M.C.K.); Wick: 2 on Mar. 27, 3 on Apr. 15, and singles on Oct. 7 & 12 (D.R.H.); Stoke Bishop: singles on Aug. 17, Oct. 6 & 12 (A.D.R.B.); Westbury-on-Trym: 4 on Sept. 14 (C.W.W.); Downend: 2 during Sept. (D.M.S.); Bedminster Down: 1 on Oct. 2 (B.S.); Bishop Sutton: singles on Aug. 11 and Oct. 6 (D.W.); Long Ashton: 1 on Oct. 13 (M.Q.); Upper Eastville: 1 on Aug. 22 (B.L.K.).

S. Shipham: 1 larva on Sept. 1, singles on Oct. 12 & 19 (T. & M.S.); Saltford: seen on Apr. 21 (A.K.); Abbots Leigh: several during late Aug. (C.G.).

Aricia agestis Schiff. (Brown Argus)

An encouraging year for the species with many new sightings. Several minor aberrations were taken in Dorset during June (A.D.R.B.), but nothing in the way of variation was noted from the Bristol district.

G. Inglestone Common: 1 on May 25 (A.D.R.B.); Stinchcombe Hill: numerous on June 30 (A.D.R.B.); Ozleworth Bottom: several on Aug. 10 (A.D.R.B.); Haresfield: a few on Aug. 18 (A.D.R.B.); Kingsweston Down: a few on Aug. 22 (A.D.R.B.), 2 on Aug. 23 (C.W.W.).

S. Charterhouse: several fresh specimens on June 9 (J.F.B.); Shipham: singles on June 10 & 18, 4 on Sept. 2, 2 on Sept. 18 (T. & M.S.); Cheddar: at least 20 on June 9 (T. & M.S.); Goblin Combe: plentiful on June 9 (A.D.R.B.); Clevedon: 1 on June 8 (J.F.B.); Sandford Hill: 3 on Aug. 31 (T. & M.S.); Dolebury Warren: seen on June 15 (A.K.); Sand Point: 1 on Aug. 25 (T. & M.S.).

Polyommatus icarus Rott. (Common Blue)

Once again seen in fair numbers, although no aberrations were taken.

G. Stinchcombe Hill: numerous on June 30 (A.D.R.B.); Filton: 2 on Aug. 23 & 26 (R.A.); Wick: singles on Sept. 1 & 8 (D.R.H.); Inglestone Common: common on June 3 (D.G.G.); Haresfield: several on Aug. 18 (A.D.R.B.); Roman Villa, Chedworth: many males and 3 females on Aug. 25 (C.W.W.); Kingsweston Down: several on July 31, Aug. 2, 4 & 22 (A.D.R.B.); Eastville Park: 3 on Aug. 22 (B.L.K.); Avon Gorge: 1 on Aug. 23 (T. & M.S.).

S. Sand Point: seen regularly in small numbers from May 4 to Sept. 12 (R.A., A.K. and T. & M.S.); Brean Down: 2 on Aug. 8 (T. & M.S.), 3 on Aug. 18 (R.A.); Cheddar: at least 20 on June 9 (T. & M.S.); Charterhouse: several on June 9 (J.F.B.); Blagdon: 1 on Aug. 24 (T. & M.S.); Goblin Combe: plentiful on June 9 (A.D.R.B.); Draycott: several on Aug. 10 (T. & M.S.); Berrow: 2 on Aug. 11 (R.A.); Shapwick Heath: 4 on June 8, 8 on June 17 (T. & M.S.); Walton Hill, Street: seen on May 25 (K.H.P.); Sandford Hill; at least 6 on August. 31 (T. & M.S.).

Lysandra coridon Poda (Chalkhill Blue)

This is now a very local species, and is still declining in numbers. No records were received for Gloucestershire.

S. Brean Down: at least 50 sitting on grass-heads during dull weather on Aug. 8 (T. & M.S.), 2 on Aug. 18 (R.A.); Worlebury: 2 on Aug. 3 (R.A.); Draycott: several on Aug. 10 (T. & M.S.).

Lysandra bellargus Rott. (Adonis Blue)

Although only three records (two doubtful) were received from the Bristol district, the species was in absolute profusion during the first brood at a certain locality in Dorset.

S. Brean Down: seen on Sept. 13 (R.A.).

Celastrina argiolus L. (Holly Blue)

There was again no sign of an increase in the numbers of this fairly widespread species.

G. Haresfield: 1 on Aug. 18 (A.D.R.B.); Westbuy-on-Trym: singles on Apr. 19, Aug. 23 and Sept. 14 (C.W.W.); Durdham Down: 1 male on Aug. 30 (C.W.W.); Stoke Bishop: 1 on May 1 (A.D.R.B.).

S. Shipham: singles on Apr. 21, 23 & 25, May 2 & 16, and Aug. 24 (T. & M.S.); Saltford: seen on Apr. 28 (A.K.); Cheddar: 1 on Apr. 21 (T. & M.S.); Kew Stoke: seen on July 28 (A.K.).

Cupido minimus Fuessl. (Small Blue)

Still a very rare species around Bristol, but was abundant during June in Dorset.

S. Worlebury: seen on June 12 (K.H.P.).

Lycaena phlaeas L. (Small Copper)

This species was a little more common in the Bristol district than in previous years, with a good proportion of ab. *caeruleo-punctata* on Kingsweston Down (**G**) (A.D.R.B.)

G. Roman Villa, Chedworth: 1 on Aug. 25 (C.W.W.); Haresfield: several on Aug. 18 (A.D.R.B.); Filton: 29 larvae on Nov. 4 (C.W.W.); Wick: 1 on Sept. 8 (D.R.H.); Kingsweston Down: seen in fair numbers from May 19 to Aug. 23 (A.D.R.B. and C.W.W.); Henbury; 10 larvae on Jan. 14 (A.D.R.B.), 2 on May 19 (A.D.R.B. and C.W.W.), several larvae on Nov. 4 (C.W.W.); Stoke Bishop: 1 on June 15 (A.D.R.B.); Kingsdown: seen on Aug. 14 (C.G.).

S. Sand Point: noted in small numbers from July 21 to Sept. 8 (A.K., R.A. and T. & M.S.); Charterhouse: very numerous on June 1 (C.W.W.), several on June 9 (J.F.B.), 1 on Aug. 5 (T. & M.S.); Shipham: singles on May 20 and Oct. 13, 10 on Aug. 21 & 26 (T. & M.S.); Wain's Hill, Clevedon: 3 or 4 on June 9 (J.F.B.); Ladye Bay, Clevedon: 1 on May 19 (T. & M.S.); Priddy: several on Aug. 4 (D.W.).

Callophrys rubi L. (Green Hairstreak)

A local species but usually common where it occurs.

G. Inglestone Common: 2 on May 26 & 31 (A.D.R.B.); Nympsfield: 1 on May 26 (A.D.R.B.); Edge Hill: 1 male on May 5 (C.W.W.).

S. Goblin Combe: 3 on June 9 (A.D.R.B.); Cheddar: plentiful on May 12, 3 on June 9 (T. & M.S.); Dolebury Warren: seen on June 15 (A.K.).

Thecla quercus L. (Purple Hairstreak)

S. Shipham: 1 at Buddleia on Aug. 23 (T. & M.S.); Street: several larvae beaten from oak on May 25 (K.H.P.).

Thecla betulae L. (Brown Hairstreak)

S. Street: several larvae on May 25 (K.H.P.).

Strymonidia w-album Knoch (White-Letter Hairstreak)

This is still a very rare and local species, but a strong colony was discovered in Gloucestershire during August.

G. Nr. Wotton-under-Edge: common Aug. 10 (A.D.R.B.); Kingsweston Down: 1 worn specimen on Aug. 22 (A.D.R.B.).

S. Worlebury: 1 larva beaten from Wych Elm on May 31 (K.H.P.).

Pieris brassicae L. (Large White)

The usual numbers reported, the first being seen at Wick (**G.**) on Apr. 26 (D.R.H.), and the last at Sand Point (**S.**) on Oct. 6 (R.A.).

Pieris rapae L. (Small White)

Again plentiful everywhere. The first was observed at Weston-super-Mare on Apr. 10 (K.H.P.), while the last was a fresh female specimen at Kingsweston Down (**G.**) on Oct. 6 (A.D.R.B.).

Pieris napi L. (Green-veined White)

A widespread species but never very abundant. The first specimen appeared at Shipham (**S.**) on Apr. 19 (T. & M.S.), and the last at Stoke Bishop (**G.**) on Sept. 8 (A.D.R.B.).

Colias croceus Fourc. (Clouded Yellow)

This migratory species was quite rare over most of Britain during 1968, and only one specimen was reported from the Bristol district.

S. Weston-super-Mare: 1 on Sept. 9 (C.H.).

Anthocharis cardamines L. (Orange Tip)

Not as common as usual, and the emergence was divided into two by a prolonged severe cold spell which may harm some colonies.

G. Inglestone Common: 1 male on Apr. 17 (A.D.R.B.), several on Apr. 21 (D.G.G.), 6 males and 1 female on May 26 (A.D.R.B.); Charfield: singles on Apr. 22 and May 27, 3 on May 28 (M.C.K.); Filton: 1 on May 30 (R.A.); Almondsbury: 2 on Apr. 21 (D.G.G.); Westbury-on-Trym: 1 male on May 19 (C.W.W.); Coombe Dingle: 1 on May 4 (A.D.R.B.); Stapleton: 1 on Apr. 21 (B.L.K.); Brislington: 2 of each sex on June 4 (C.W.W.).

S. Charterhouse: 2 males and 1 female on June 1 (C.W.W.), several but mostly males on June 9 (J.F.B.); Cheddar: 1 on May 12 (T. & M.S.); Chew Valley Reservoir: 1 on May 4 (R.A.); Burnham-on-Sea: 1 male on Apr. 20 (C.W.W.).

Gonepteryx rhamni L. (Brimstone)

Widespread but never abundant. The first specimens were 7 or 8 males observed at Long Wood, Charterhouse (**S.**) on Mar. 8 (T. & M.S.), while the last ones were seen at Sand Point (**S.**) (R.A.) and Stoke Bishop (**G.**) (A.D.R.B.) both on Oct. 6.

Erynnis tages L. (Dingy Skipper)

G. Inglestone Common: numerous on May 25 (A.D.R.B.), several on June 3 (D.G.G.); Wotton-under-Edge: 1 on May 26 (A.D.R.B.).

S. Charterhouse: 2 on June 1 (C.W.W.), several on June 9 (J.F.B.); Cheddar: 1 on May 12, 3 on June 9 (T. & M.S.); Goblin Combe: numerous on June 9 (A.D.R.B.); Worlebury: 1 on May 19 (T. & M.S.); Shipham: up to 3 from May 16 to June 16 (T. & M.S.).

Pyrgus malvae L. (Grizzled Skipper)

G. Inglestone Common: 4 on May 26, several on May 31 (A.D.R.B.), several on June 3 (D.G.G.); Stinchcombe Hill: 1 on May 11 (A.D.R.B.); Kingsweston Down: 1 male on May 19 (A.D.R.B. and C.W.W.).

S. Cheddar: 2 on May 12, 1 on June 9 (T. & M.S.); Goblin Combe: numerous on June 9 (A.D.R.B.); Dolebury Warren: seen on June 15 (A.K.).

Thymelicus sylvestris Poda (Small Skipper)

G. Filton: 1 on July 14 (C.W.W.); Ozleworth Bottom: several on Aug. 10 (A.D.R.B.); Haresfield: 1 on Aug. 18 (A.D.R.B.); Kingsweston Down: abundant on July 31, and Aug. 2, 4 & 22 (A.D.R.B.), 2 on Aug. 23 (C.W.W.).

S. Shipham: singles on July 15 & 19, and Aug. 21 & 22 (T. & M.S.); Sand Point: common on July 21 (A.K.); Priddy Pool: many on Aug. 4 (D.W.); Cheddar: several on July 28 (T. & M.S.); Old Down: 5 on July 20 (T. & M.S.).

Ochlodes venata Br. & Grey (Large Skipper)

G. Filton: singles on July 5 & 8, and Sept. 1, 3 on July 12 & 18 (R.A.), many worn specimens on July 14 (C.W.W.); Kingsweston Down: 1 on July 9 (R.A.), abundant on July 31, and Aug. 2, 4 & 22 (A.D.R.B.), 2 on Aug. 23 (C.W.W.).

S. Uphill: 2 on July 6 (R.A.); Clevedon: 1 on June 8, 2 on June 9 (J.F.B.); Shipham: singles on June 18 & 20, and July 5, 2 on June 30 (T. & M.S.); Goblin Combe: numerous on June 9 (A.D.R.B.); Dolebury Warren: seen on June 15 (A.K.); Brean Down: 2 on July 21 (R.A.); Leigh Woods: seen on June 29 (A.K.); Sand Point: 1 on July 21 (R.A.); Keynsham: seen on June 15 (A.K.).

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ODONATA (*Dragonflies*): On Sept. 14, a large dragon fly, at least three inches in length, was observed flying in from the West having presumably crossed the Severn Estuary. A cold E.N.E. wind (Force 4) was prevailing at the time, together with periods of heavy rain. (R.J. Prytherch).

MOTHS

By K. H. Poole

THE following records have been selected from those contributed by C. S. H. Blathwayt (C.S.H.B)., J. F. Burton (J.F.B.), A. Kennard (A.K.), K. H. Poole (K.H.P.) and T. B. Silcocks (T.B.S.) Several migrant moths have been recorded—notably *A. atropos*, *H. convolvuli* and *M. unionalis*—though not in any great number. Species which appear to be new to the Somerset list are *T. juniperata* and *N. albicella*. Unless otherwise stated, single specimens were recorded and those taken at light marked by an asterisk.

Acherontia atropos L. (Death's-Head Hawk). Weston-s-Mare, brought in to Weston Museum alive on Nov. 8 (K.H.P.); Shipham, Sept. 9* (T.B.S.).

Herse convolvuli L. (Convolvulous Hawk). Weston-s-Mare, Aug. 18* (C.S.H.B.); Shipham, Oct. 7* (T.B.S.).

Deilephila porcellus L. (Small Elephant Hawk). Saltford, July 1* (A.K.).

D. elpenor L. (Elephant Hawk). Clevedon, July 1(2)* (J.F.B.).

Macroglossum stellatarum L. (Hummingbird Hawk). Sand Point, Kewstoke, July 28 (R. Angles).

Stauropus fagi L. (Lobster Moth), Leigh Woods, Bristol, June 29, July 1* (A.K.).

Pheosia gnoma Fab. (Lesser Swallow Prominent). Clevedon, July 1* (J.F.B.).

Achlya flavicornis L. (Yellow-Horned). Shipham, Mar. 30-April 5 (3)* (T.B.S.).

Polyploca ridens Fab. (Frosted Green). Shipham, Apr. 24, 26* (T.B.S.).

Gastropacha quercifolia L. (Lappet). Cheddar, Aug. 1 (♀, to lighted window) (T.B.S.).

Saturnia pavonia L. (Emperor). Shipham, May 15* (T.B.S.).

Drepana falcataria L. (Pebble Hook-Tip), Hencliffe Woods, Bristol, June 14* (A.K.).

D. cultraria Fab. (Barred Hook-Tip). Shipham, Aug. 4, 23* (T.B.S.).

Nola cucullatella L. (Short-Cloaked). Shipham, July 10, 25* (T.B.S.).

Earias chlorana L. (Cream-bordered Green Pea). Shapwick, June 14* (C.S.H.B.).

Apatele leporina L. (Miller Dagger). Clevedon, July 1* (J.F.B.); Saltford, July 1* (A.K.).

A. alni L. (Alder Dagger), Weston-s-Mare, end of May* (C.S.H.B.); Saltford, June 1 (1), 14 (4)* (A.K.);

Cryphia muralis Forst. (Marbled Green). Shipham, Aug. 7* (T.B.S.).

Lycophotia porphyrea Schiff. (True-Lovers' Knot). Clevedon, July 1* (J.F.B.).

Diarsia brunnea Schiff. (Purple Clay). Leigh Woods, Bristol, July 1* (A.K.).

Anaplectoides prasina Schiff. (Green Arches). Leigh Woods, Bristol, June 27, 29, July 1* (A.K.); Cheddar, July 5 (4), 14 (2)* (T.B.S.).

Polia advena Schiff. (Pale Shining Brown). Saltford, June 29* (A.K.).

Hadena trifolii Hufn. (Nutmeg Moth). Cheddar, June 16* (T.B.S.).

Bombycia viminalis Fab. (Minor Shoulder-knot). Shipham, July 25* (T.B.S.).

Griphosia aprilina L. (Merveille du Jour). Shipham, October 19* (T.B.S.).

Phaloena typica L. (Gothic). Shipham, July 9* (T.B.S.).

Apamea furva Schiff. (The Confused). Weston-s-Mare, June 30, July 1* (C.S.H.B.).

Xylophasia monoglypha Hufn. (Dark Arches). Saltford, July 19* (melanic example) (A.K.)

Nonagria geminipunctata Haw. (Twin-spotted Wainscot). Shipham, Aug. 29* (T.B.S.).

Oria musculosa Hb. (Brighton Wainscot). Shipham, Aug. 28* (T.B.S.)

Stilbia anomala Haw. (The Anomalous). Shipham, Aug. 27*, Sept. 5* (T.B.S.)

Laphygma exigua Hb. (Small Mottled Willow), Shipham, Sept. 7, Oct. 1* (T.B.S.).

Parastichtis suspecta Hb. (The Suspected). Saltford, July 1* (A.K.).

Panemeria tenebrata Scop. (Small Yellow Underwing). Charterhouse, June 9. (J.F.B.).

Heliothis peltigera Schiff. (Bordered Straw). Milton, Weston-s-Mare, July 9* (K.H.P.); Sand Bay, Kewstoke, Oct. 6 (T.B.S.).

Eublemma parva Hb. (Small Marbled). Saltford, June 30* (A.K.).

Polychrisia moneta Fab.(Golden Plusia). Saltford, July 20* (A.K.).

Plusia iota L. (Plain Golden Y), Clevedon, July 1* (J.F.B.).

P. gamma L. (Silver Y). N. Somerset, very common, Sept. & Oct. (J.F.B.)..

Ectype glyphica L. (Burnet Companion). Charterhouse, June 9 (J.F.B.).

Ophiusa pastinum Treit. (The Blackneck). Saltford, July 22* (A.K.).

Hemistola immaculata Thunb. (Small Emerald). Saltford, July 21, 24* (A.K.).

Comiboena pustulata Hufn. (Blotched Emerald). Leigh Woods, Bristol, June 27, 29* (A.K.).

Jodis lactearia L. (Little Emerald). Shipham, Aug. 1* (T.B.S.).

Cosymbia punctaria L. (Maiden's Blush). Clevedon, July 7* (J.F.B.).

Trichopteryx carpinata Bork. (Early Tooth-Striped). Charterhouse, Apr. 15 (T.B.S.).

Triphosa dubitata L. (The Tissue). Saltford, May 29* (A.K.).

Lampropteryx otregiata Metcalfe (Metcalfe's Carpet). Shapwick, June 4* (C.S.H.B.).

Thera firmata Hb. (Pine Carpet). Shipham, Oct. 26* (T.B.S.).

T. juniperata L. (Juniper Carpet). Saltford, Oct. 5* (A.K.).

Euphyia cuculata Hufn. (Royal Mantle). Shipham, July 19* (T.B.S.).

E. rubidata Schiff. (The Flame). Shipham, July 2* (T.B.S.).

Perizoma bifasciata Haw. (Barred Rivulet). Saltford, July 25* (A.K.).

Discoloxia blomeri Curt. (Blomers Rivulet). Weston-s-Mare, June, unusually plentiful; (C.S.H.B.). Leigh Woods, Bristol, June 9, July 19* (A.K.), Cheddar June 16, July 5, 14* (5) (T.B.S.).

Eupithecia indigata Hb. (Ochreous Pug). Milton, Weston-s-Mare, May 16* (K.H.P.)

E. venosata Fab. (Netted Pug). Shipham, June 12* (T.B.S.).

E. absinthiata Cl. (Wormwood Pug). Leigh Woods, Bristol, June 29* (A.K.).

E. valerianata Hb. (Valerian Pug). Shapwick, June 28*, several (C.S.H.B.).

E. plumbeolata Haw. (Lead-coloured Pug). Hencliffe Woods, Bristol, June 14(A.K.).

E. inturbata Hb. (Maple Pug). Leigh Woods, Bristol, June 27* (A.K.).

E. nanata Hb. (Narrow-winged Pug). Shipham, July 26* (2) (T.B.S.).

Bapta temerata Schiff. (Clouded Silver). Clevedon, July 1* (J.F.B.).

Ellopia prosapiaria L. (Barred Red). Leigh Woods, Bristol, July 1* (A.K.); Shipham, July 2* (2) (T.B.S.).

Selenia lunaria Schiff. (Lunar Thorn). Saltford, May 29, June 8, 15* (A.K.).

Angeronia prunaria L. (Orange Moth). Saltford, June 30* (A.K.).

Cepphis advenaria Hb. (Little Thorn). Leigh Woods, June 6*, several by day (A.K.).

Semiothisa liturata Cl. (Tawny-Barred Angle). Leigh Woods, Bristol, July 1, 19*. Saltford, July 21* (A.K.).

Chiasmia clathrata L. (Latticed Heath). Ashcott Heath, June 3*, Hencliffe Woods, Bristol, June 14* (A.K.).

Erranis leuchophaearia Schiff. (Spring Usher). Shipham, Jan. 22* (T.B.S.).

Ectropis consonaria Hubn. (The Square Spot). Weston-s-Mare, early June* (C.S.H.B.).

Bupalus piniaria L. (Bordered White). Shipham, June. 17, July 10*. (T.B.S.).

Perconia strigillaria Hb. (Grass Wave). Compton, Street, June 6 (A.K.).

Crambus pinellus L. Saltford, June 8* (A.K.).

Margaronia unionalis Hubn. Weston-s-Mare, Oct. 20* (C.S.H.B.); Shipham, Oct. 26* (T.B.S.).

Perinephela lancealis Schiff. Hencliffe Woods, Bristol. June 14*. Leigh Woods, Bristol, June 29, July 19* (A.K.).; Cheddar, July 5* (T.B.S.).

Nomophila noctuella Schiff. Milton, Weston-s-Mare, July 26, Sept. 4* (K.H.P.); Shipham, July 13—Sept. 14* (10) (T.B.S.).

Pyrausta nigrata Scop. Windmill Hill, Street, June 3 (A.K.); Shipham, Sept. 6* (T.B.S.).

P. aurata Scop. Shipham, July 19, 27* (T.B.S.).

Evergestis pallidata Hufn. Saltford, July 29* (A.K.).

Endotriche flammealis Schiff. Saltford, Aug. 6* (A.K.).

Hypsopygia costalis Fab. Clevedon, July 10*(2) (J.F.B.).

Alucita tridactyla L. Compton, Street, June 30 (A.K.).

Lozopera francillana Fab. Saltford, July 1* (A.K.).

Leucoptera spartifoliella Hubn. Keynsham, July 13* (A.K.).

LEPIDOPTERA NOTES, 1967, MOTHS:

It has been pointed out that *Plusia bractea* Schiff, noted as probably the first record for Somerset, was previously recorded from Weston-s-Mare in 1959(C.S.H.B.).

MAMMAL SURVEY
BRISTOL DISTRICT, 1968

By Roger G. Symes

INTEREST in the mammal survey remained high during 1968, 745 records of observations made within the survey area being received. The publication of maps (Symes, 1968) showing the distribution recorded for twelve species during 1967 stimulated members to send in records, especially of the more common mammals, from new localities. As in previous years details of one record per 10 km. square for each species was forwarded to the Mammal Society.

INSECTIVORA

Mole (*Talpa europaea*) and hedgehog (*Erinaceus europaeus*) were again the species most recorded. It is of interest to note that suburbia appears to be forming a physical barrier against the mole; very few signs of activity have been noted within the limits of the City of Bristol. One record of particular interest was the discovery of the remains of a mole trapped in a discarded milk bottle, the first record of this occurrence. Most hedgehog records were of animals either killed on roads or else seen on cultivated land, a habitat in which it seems to thrive. Bottles, and owl and kestrel pellets, proved to be valuable sources for records of common shrew (*Sorex araneus*), which was found regularly, and pigmy shrew (*Sorex minutus*) which was found twelve times in Somerset. Skulls of the rarer water shrew (*Neomys fodiens*) were discovered in bottles in two areas in Somerset and one in Gloucestershire.

CHIROPTERA

Lesser horseshoe bat (*Rhinolophus hipposideros*) was recorded from several caves in the Mendips and a young pipistrelle (*Pipistrellus pipistrellus*) was found dead at Westbury-on-Trym, Bristol.

CARNIVORA

Fox (*Vulpes vulpes*) and badger (*Meles meles*) were recorded regularly throughout the year, the former especially from the City of Bristol, but no records have yet been received for either species from the coastal area of Somerset. Stoat (*Mustela erminea*) and weasel (*Mustela nivalis*) were not often reported and no records were received of otter (*Lutra lutra*). There was an increase in the number of records of American mink (*Mustela vison*) but the distribution remained localized around the area shown by Jones (1967).

ARTIODACTYLA

The first sightings of deer in the district were in Somerset, roe-deer (*Capreolus capreolus*) and red deer (*Cervus elaphus*) being recorded on the Mendips. Red deer was also reported on a golf course in Bristol.

LAGOMORPHA

Hare (*Lepus capensis*) and rabbit (*Oryctolagus cuniculus*) were recorded from most 10 km. squares in the survey area although the total number of records was small.

RODENTIA

There was a large increase in the numbers of records of long-tailed field mouse (*Apodemus sylvaticus*) and short-tailed vole (*Microtus agrestis*) as a result of regular bottle hunts and analyses of bird pellets, but remains of house mouse (*Mus musculus*) and bank vole (*Clethrionomys glareolus*) were recorded less often from these sources. Skulls of yellow-necked mouse (*Apodemus flavicollis*) and harvest mouse (*Micromys minutus*) were found in pellets in Somerset and a hibernating dormouse (*Muscardinus avellanarius*) was discovered in that county on 30 March, a breeding nest having previously been found in a hawthorn. Grey squirrel (*Sciurus carolinensis*) and brown rat (*Rattus norvegicus*) were recorded throughout the survey area but there were no records of black rat (*Rattus rattus*). Only eight records were received of water vole (*Arvicola terrestris*) and its distribution remains poorly recorded.

Twenty-six species of mammals were recorded in the Bristol District in 1968. Systematic surveys such as the Mammal Section's bottle hunt in April have resulted in valuable new records, but easily recognized species such as house mouse, water vole, stoat and weasel are still poorly recorded. Information is required on every species and all records will be welcomed, but those of bats and the less common species should always include evidence of identification.

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Thanks are due particularly to E. W. Powell and T. B. Silcocks who were separately responsible for large numbers of records, and also to the following for their contributions:—Dr. R. A. Avery, G. A. Baker, Miss A. E. Bennett, A. B. Blakemore, J. M. Boyd, M. E. Collins, R. M. Curber, Mrs. R. Duckett, Miss J. D. Ethelston, P. L. Garvey, Miss I. F. Gravestock, B. J. Gregory, R. J. W. Hall, H. R. Hammacott, D. P. Harvey, B. S. F. Hessey, R. M. Hill, Mrs. A. R. Holeton, G. F. Holeton, N. P. Humphris, A. F. Jayne, D. E. Ladhams, Miss E. J. Lenton, Ministry of Agriculture, Fisheries and Food, W. F. Parker, Dr. D. H. Peregrine, Miss B. A. Pettitt, F. H. Rawlings, J. G. Riley, Miss M. H. Rogers, Miss R. C. H. Shepherd, Dr. C. E. D. Smith, E. S. Smith, Miss J. Sullivan, S. M. Taylor, G. A. Turrell, R. G. Williams.

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Book Review

Maurice Burton. Wild Animals of the British Isles : xxvi × 222 pp., 40 Plates. Wayside & Woodland Series: Frederick Warne & Co. Ltd., London. 1968. 40s.

Dr. Burton has written an interesting book on the natural history of the British "four-footed beasties"—the mammals, reptiles and amphibia. Readers may be familiar with his delightfully informative articles in the *Illustrated London News* over a number of years. Much of the text is devoted to anecdotes; some very instructive, some dubious, all interesting. The book is illustrated by a very fine series of plates, but the text-figures are often inadequate and even confusing; for example, the drawings of squirrel and rat dentitions are barely distinguishable. Measurements are given in inches and metrically. The dental formula is quoted for each mammal species, though quite why is not always clear since often it is irrelevant to the text and the work is not intended as a key to identification. There is a useful index and the book is reasonably priced. Essentially a pot-pourri of natural history lore, this book should interest many naturalists.

R. J. G. Savage

Book Reviews

Mimicry in Plants and Animals, by Wolfgang Wickler. Translated by R. D. Martin. World University Library. Weidenfeld and Nicholson, 5 Winsley Street, London W.1. 1968. 16/–. Here is a straightforward, clear, comprehensive, up to date and cheap account of one of the most fascinating of natural phenomena. Wickler explains the advantages of a harmless species resembling a poisonous or distasteful one and goes on to consider the advantages of two poisonous species resembling each other—with a variant in which the more poisonous species mimics the less poisonous! Each story is well told and well illustrated and there are some examples of mimicry you have never heard of before such as flowers mimicking female insects so that the males are attracted and pollinate the flower. The whole range of mimicry is described and explained and it makes a book I thoroughly recommend.

R. Bassindale

Wayside and Woodland Fungi, by W. P. K. Findlay. 65/–. The text of this latest book on fungi for the layman is interesting and provides an excellent introduction to the larger fungi generally and to the modern system of classification. The illustrations however are very variable in quality, and while those by Beatrix Potter are certainly pretty those by other artists are often disappointing. The reproduction of the photographs is incredibly bad for a modern book.

A useful feature of Findlay's book is his use of English names wherever possible, although these do not always correspond with those recommended by the British Mycological Society. Many fungi of course do not have common English names, and here literal translations of the Latin names is most useful.

His keys to the identification of species in several of the groups of fungi are very useful, but it is unfortunate that he has added to the confusion in the Polypores by adopting a nomenclature that is not accepted by most British mycologists.

Fungi are associated directly or indirectly with most other living things, and everyone who claims to be a naturalist should have an elementary knowledge of fungi. For the armchair student of mycology this is probably the most readable book, although for the field mycologist the Collins Guide to Mushrooms and Toadstools is a better book and certainly better value.

C. E. D. Smith

Grasshoppers, Crickets and Cockroaches of the British Isles by D. R. Ragge. $8\frac{1}{2}$ x 6 ins., xii + 299 pp., 22 colour plates, 130 text figures, London (Frederick Warne & Co. Ltd.), 1965. Price 44/–.

In the reviewer's opinion, this is one of the best books to appear in the excellent Wayside and Woodland series and meets the long felt need for an up-to-date, authoritative and adequately illustrated reference book to the British Orthoptera. Already it has inspired more entomologists, both young and old, to study this much neglected insect group.

Every native British and introduced species, and some accidentally imported aliens, are illustrated in colour, furthermore, identification is greatly assisted by the provision of clear, easily understood keys and fine line drawings by the author. English names are given for all species in addition to the scientific ones, and distribution maps are provided where necessary.

As well as the full descriptions and accounts of each species which occupy the bulk of the book, there are interesting and useful chapters on where to find them, their distribution and history, classification, ecology and habits, collecting and breeding.

A companion 7-inch $33\frac{1}{3}$ r.p.m. record is also available, price 14s. 4d. It includes recordings of the songs or chirps of most of the British species made by Dr. Ragge, J. F. Burton and G. F. Wade.

J. F. Burton.

THE INFERIOR OOLITE OF THE COTSWOLD SCARP, WOTTON-UNDER-EDGE TO LECKHAMPTON

By J. W. Murray
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ABSTRACT

Many of the classic localities and three new localities are illustrated by measured sculptured sections. The limestones are described using modern terminology. The distribution of the limestone types within the Inferior Oolite stratigraphy is used to suggest the environments of deposition of the rocks.

INTRODUCTION

The long history of research on the Inferior Oolite of the Cotswolds has been described in detail by Richardson (1910). Outstanding amongst the researchers was S. S. Buckman; his detailed analysis of the ammonite faunas (monographs 1887–1907) enabled him to make reliable stratigraphic correlations (1895, 1897, 1901) throughout the Cotswold region. Where ammonites were rare Buckman made use of the abundant brachiopod faunas (1895, pp. 439–461). His work was extended and modified in detail by Richardson (1910). Since that time no major publication on the Inferior Oolite has appeared. There have been reports of new or undescribed exposures (Channon, 1950; Hancock, 1966), numerous reports of field excursions to the area by the Cotteswold Naturalists' Field Club and the Geologists' Association, and a regional summary of Cotswold stratigraphy by Arkell (1933). In general, those papers following that of Richardson (1910) give only an abridged account of earlier information, with little or no new data.

With the exception of an early contribution by Wethered (1891), the microscopic structure of the Inferior Oolite limestones has not been described. Field descriptions of the lithology have either been uninformative or misleading; 'grit' was used to denote coarser grained limestones, 'ragstone' was applied to richly fossiliferous bioclastic limestones and 'freestone' to mainly oolitic limestones.

The present study was undertaken primarily to prepare an up-to-date excursion guide to the Cotswolds (Murray, unpublished MS.) but only the region between Wotton-under-Edge and Cheltenham is considered here. At each locality described here the section has been measured and all the limestone bands have been sampled. In the laboratory the samples were polished, etched in dilute (1·75%) HCl, and stained with alizarin red S and potassium ferrocyanide in acid solution. When dry an acetate peel of the etched surface was prepared for examination under the microscope. All the limestones (approximately 200 samples) have been described according to the classification proposed by Folk (1959, 1962), see Editor's Note on page 551. Due to limitations of space most of the data have been condensed to fit on the illustrated measured sections. Three quarries have been described for the first time and the Leckhampton exposures have been re-described.

A summary of the stratigraphy is given in fig. 1.

FORMATION	GROUP	STAGE
Clypeus Grit Upper *Trigonia* Grit	Upper Inferior Oolite	Upper Bajocian
	Unconformity	
Notgrove Freestone *Gryphite* Grit *Buckmani* Grit Lower *Trigonia* Grit	Middle Inferior Oolite	Lower Bajocian
	Unconformity	
Upper Freestone Oolite Marl Lower Freestone Pea Grit Lower Limestone	Lower Inferior Oolite	Upper Aalenian
Scissum Beds		Lower Aalenian

Fig. 1

DESCRIPTION OF SECTIONS

Breakheart Hill Quarry (ST/756967)

The section was described by Woodward (1894, p. 108) and noted by Richardson (1910, p. 109). However, the quarry was re-opened during the 1950's to provide stone for the nuclear power station at Berkeley and the newly enlarged quarry faces are described here for the first time (fig. 2).

The exposure is divided into two parts, a small lower quarry, within a large upper quarry. The floor of the latter is the unconformity surface.

In the north-east corner of the lower quarry the Lower Freestone is divided into harder, sometimes cross bedded, oolitic beds, generally less than 1 ft. thick, separated by softer, marly and somewhat rubbly partings. (fig. 2, Lower Q). The top of the Freestone is a cross-bedded biosparrudite truncated by the unconformity. Above this, a small unquarried remnant of Upper *Trigonia* Grit commences with a 3 inch bed of softer oolitic and bioclastic limestone. The main bed is 4 ft. of hard oobiosparite containing intraclasts, *Girvanella*-bearing pisoliths, polyzoan bioclasts and columnals of *Pentacrinus*. Many of the bioclasts have a micrite envelope. The upper surface of the bed is bored; this probably represents a small local unconformity or non sequence. The top 15 ins. of shattered highly fossiliferous limestone (terebratulids and *Ctenostreon*) representing the base of the *Clypeus* Grit is not exposed elsewhere in the quarry.

The upward continuation of the *Clypeus* Grit succession can be seen in the north-west part of the upper quarry (fig. 2 "Upper"). The lowest bed exposed forms a terrace from which the overburden has been removed; it is an intramicrite, 8 ins. thick, with abundant *Stiphrothyris* and *Acanthothyris*. Two loose blocks believed to have come from this horizon have yielded *Parkinsonia parkinsoni* (J. Sowerby). Above a small scree, 5 ft. of oosparite (with intraclasts and *Stiphrothyris*) are followed by a soft parting, then two further beds of oomicrite with *Stiphrothyris* and *Acanthothyris*. These are separated from the topmost bed of oomicrite by 6 ins. of rubbly limestone, and the succession is capped by a rubbly biomicrite with *Stiphrothyris*.

The floor of the upper quarry represents the unconformity surface. It shows small scale rotational movements due to cambering. In other quarries the unconformity is marked by the presence of annelid and *Lithophaga* borings into the underlying limestone or by the presence of oysters adhering to the upper surface of the limestone. In this quarry borings are not common but the relationship of the oysters to the unconformity is clearly seen; they show a marked clumped distribution—high density patches showing a wide range of oyster size (and therefore stage of development) are separated by extensive areas of bare rock free from oysters. The present arrangement must closely resemble the appearance of the sea floor in early Upper *Trigonia* Grit time.

DURSLEY (ST/749978).

On the north side of the Broadway is a fine section which although mentioned briefly by Woodward (1894, p. 108) does not seem to have been described. The quarry has been worked at an upper and a lower level.

The lower quarry is cut in Lower Inferior Oolite. In the east face

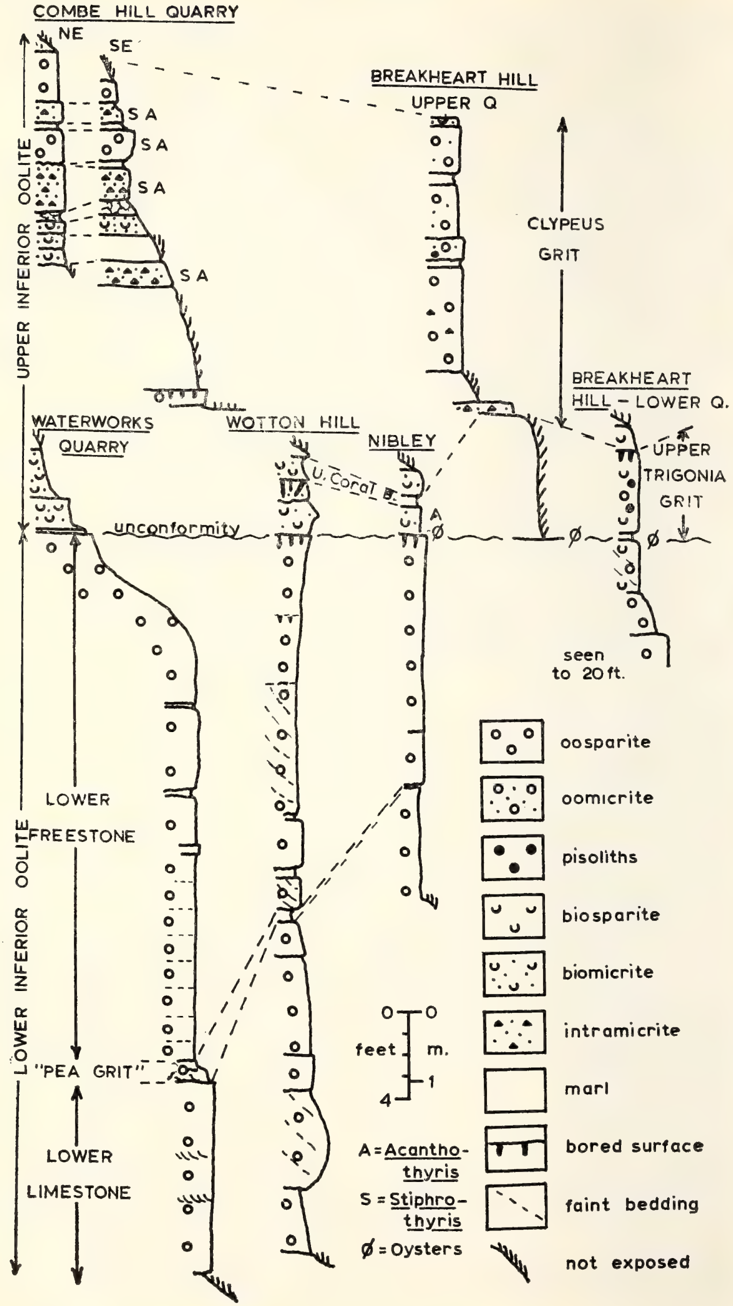
COMBE HILL QUARRY
NE
SE
SA
SA
SA
SA
BREAKHEART HILL
UPPER Q
CLYPEUS
GRIT
UPPER INFERIOR OOLITE
BREAKHEART
HILL - LOWER Q.
UPPER
TRIGONIA
GRIT
WATERWORKS
QUARRY
WOTTON HILL
NIBLEY
U. Coral B.
A
Ø
unconformity
Ø
Ø
seen
to 20 ft.
LOWER
FREESTONE
LOWER INFERIOR OOLITE
"PEA GRIT"
LOWER
LIMESTONE
oosparite
oomicrite
pisoliths
biosparite
biomicrite
intramicrite
marl
bored surface
faint bedding
not exposed
0
0
feet
m.
1
4
A = Acanthothyris
S = Stiphrothyris
Ø = Oysters

Fig. 2. Measured sections in the South Cotswolds.

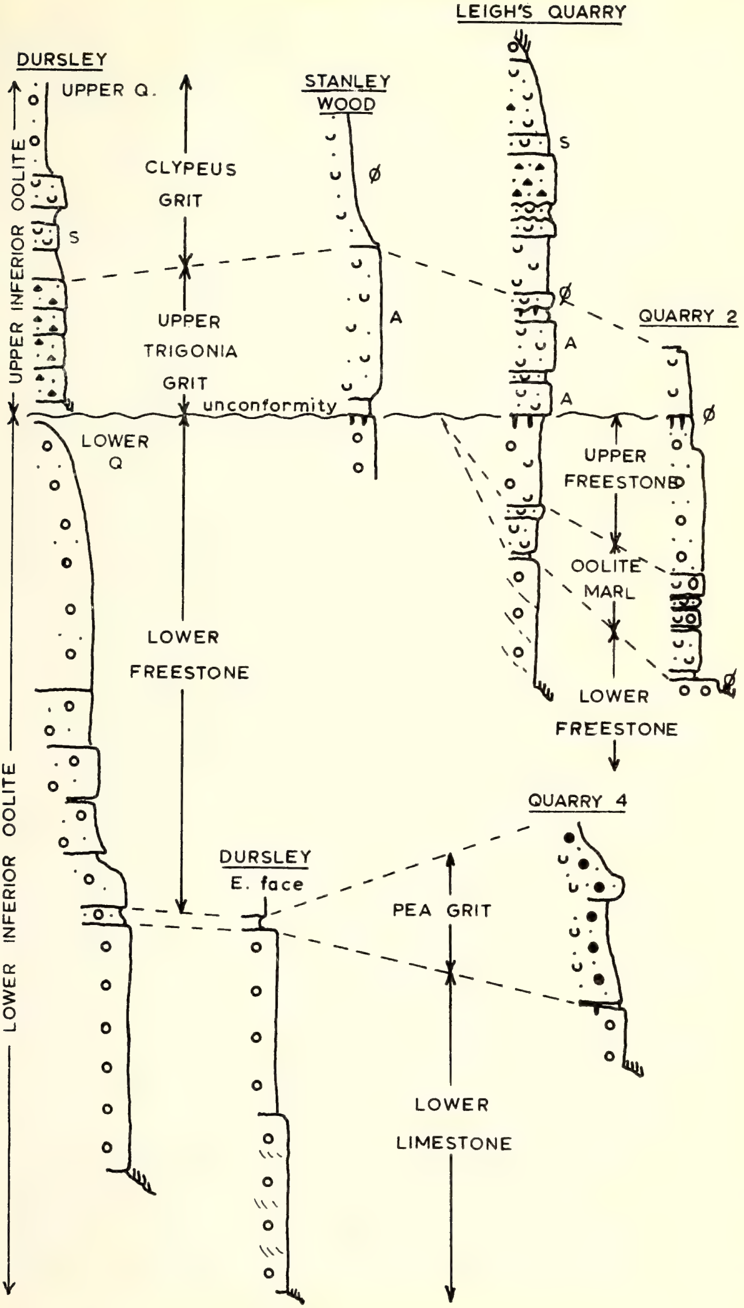
LEIGH'S QUARRY
DURSLEY
STANLEY WOOD
UPPER Q.
UPPER INFERIOR OOLITE
CLYPEUS GRIT
S
S
Ø
A
Ø
QUARRY 2
UPPER TRIGONIA GRIT
A
A
unconformity
Ø
LOWER Q
UPPER FREESTONE
OOLITE MARL
LOWER FREESTONE
LOWER FREESTONE
Ø
LOWER INFERIOR OOLITE
QUARRY 4
DURSLEY E. face
PEA GRIT
LOWER LIMESTONE

Fig. 3. Measured sections in the mid-Cotswolds (see fig. 2 for key to ornament).

are two massive beds of oosparite of the Lower Limestone (fig. 3). The central part of the quarry is strongly affected by gull development and cambering. The main section was measured to the west of the large gull with the cave. Some 11 ft. of massive oosparite (with echinoderm and polyzoan bioclasts) are followed by 9 ins. of marly, nodular oomicrite which may be equivalent to the Pea Grit. This rock includes pisoliths, echinoderm and polyzoan bioclasts, together with composite grains. Above this, a series of oomicrites and oosparites occurring as harder beds, each generally more than 2 ft. thick, and separated by marly partings, constitutes the Lower Freestone. The top of this forms the floor of the upper quarry which is probably the level of the unconformity.

The section in the upper quarry consists of Upper *Trigonia* Grit (5 ft. 6 ins. exposed above a small scree) and *Clypeus* Grit (seen to 8 ft.). The former is represented by four principal beds of hard, rubbly intramicrite with abundant serpulids. The *Clypeus* Grit commences with 15 ins. of soft marly limestone, then 1 ft. of fine-grained biomicrite with occasional ooliths, intraclasts and *Stiphrothyris*. A further 10 ins. soft limestone separate this from the next hard fossiliferous biomicrite which again contains intraclasts, some being of oomicrite. The section is capped with 4 ft. 4 ins. of oomicrite.

Catbrain Quarry, Painswick (SO/866115).

This quarry, situated to the south-west of Castle Godwyn on the A46(T) road, has previously been described in outline by Hancock (1966) who recorded Lower and Middle Inferior Oolite.

The south end of the quarry shows the best exposure (fig. 4, section 1 to the east and section 2 to the west of a small fault). In the lower part of the face (fig. 4, section 2) there are 26 ft. of oomicrites and oosparite (with some composite grains and densely packed ooliths), then a 9 inch marl band and a further 8 ft. of oosparites and oomicrites forming the Lower Freestone. The passage to the Oolite Marl is poorly exposed but the upper part is an alternation of soft marls and somewhat harder oomicrites with abundant bioclasts. The topmost bed is bored on its upper surface and represents the unconformity. On lithological grounds there is no reason to believe that any Upper Freestone is present here.

The Middle Inferior Oolite commences with the Lower *Trigonia* Grit. A basal bed of bioturbated marl with common internal moulds of *Pholadomya* is followed by two distinctive beds of fossiliferous biomicrite. These beds have been weathererd along joint surfaces in such a manner that the recrystallised calcitic bivalve shells project from the biomicrite matrix. Intraclasts are present in the upper bed. The *Buckmani* Grit has a basal fine sand horizon, the upper surface of which is moulded to the very irregular base of the succeeding sandy biomicrite. This, in turn, is separated by a thin marl band from a massive bioturbated sandy biomicrite crowded with bivalves. The remainder of the succession is *Gryphite* Grit, a rubbly, nodular, sandy biomicrite with irregular sandy partings. It is extremely bioturbated and richly fossiliferous: *Gryphaea sublobata* Deshayes, and belemnites; *Ctenostreon* occurs at the base.

There is some uncertainty about the boundaries between the Middle Inferior Oolite members here. Buckman (1895) described the Lower *Trigonia* Grit as 3 ft. 6 ins. of "Yellow, ironshot, oolitic stone, somewhat marly" at nearby Scotesquar Hill, while at Kimsbury Castle it was stated to comprise 7 ins. "brown ironshot marl," 4 ins. "hard, brown ironshot shelly stone," and 1 in. "brown marl." At these two localities the sandy horizon within the *Buckmani* Grit was 8 ins. and 3 ins. thick respectively and came above the base of the formation.

The importance of this exposure is that it lies within the Painswick syncline. The Middle Inferior Oolite is missing to the south at Selsley Common and to the north at Birdlip.

LECKHAMPTON HILL (SO/939185.)

This classic locality has figured prominently in descriptions of Cotswold geology. However, little has been added to the knowledge of this area since the time of Richardson (1904).

The section in the main quarry extends from the Upper Lias through the Lower Inferior Oolite to the "Ragstones" of the Middle Inferior Oolite. However, the only part of the section which is readily examined here is the lower part, up to the junction of the Pea Grit and the Lower Freestone (fig. 5, Main Quarry). The Oolite Marl is best seen in the south Quarry and the "Ragstones" in the small quarry on the top of the hill by the steep incline.

The contact of the *Scissum* Beds and the Upper Lias Clay is normally kept exposed by the activities of visiting geologists. The former commence with a 1 ft. band of soft fine-grained sandstone which passes up into an impure muddy and sandy biomicrite containing numerous pockets of soft ferruginous fine sand. Brachiopods occur together with bioclasts of echinoderms and bivalves (fig. 5, Main Quarry).

The base of the Lower Limestone is a hard ferruginous biomicrite with chamosite ooliths and crinoid bioclasts. The succeeding softer and rubbly limestones are impure biomicrites again with crinoid bioclasts.

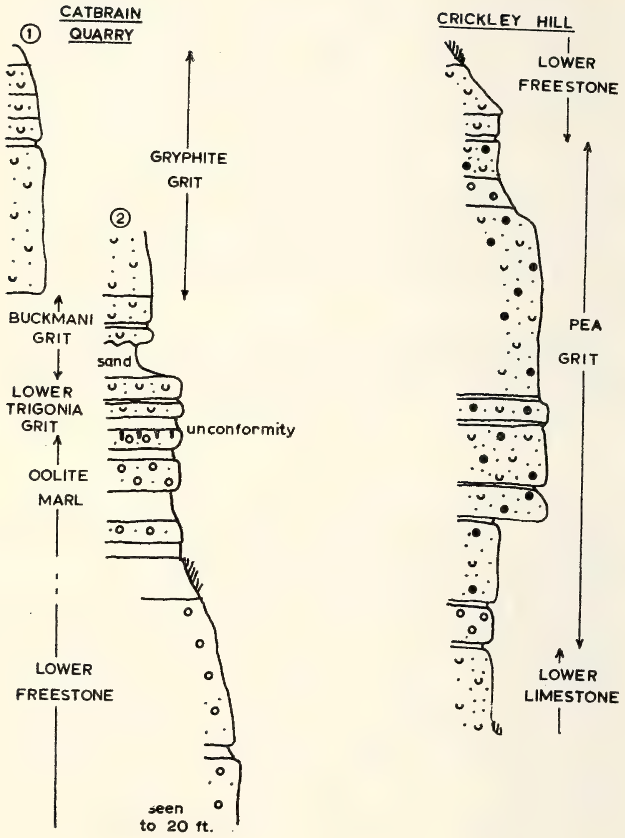
CATBRAIN QUARRY
①
②
GRYPHITE GRIT
BUCKMANI GRIT
sand
LOWER TRIGONIA GRIT
unconformity
OOLITE MARL
LOWER FREESTONE
seen to 20 ft.
CRICKLEY HILL
LOWER FREESTONE
PEA GRIT
LOWER LIMESTONE

Fig. 4. Measured sections at Painswick and Crickley Hill (see fig. 2 for key to ornament).

The Pea Grit is a richly fossiliferous pisolith-bearing series of limestones. The basal bed is a biomicrite with crinoid and bivalve bioclasts, some of which form the nuclei of the elongate and often flattened pisoliths. In these the tubes of *Girvanella* are sometimes to be seen. A thin marl band separates this bed from a series of harder beds which form a 6 ft. cliff. These are biosparrudites with crinoid bioclasts and pisoliths. Above is a grassy slope representing about 12 ft. of unexposed succession although in the cliff behind the concrete lime-kilns a ferruginous rubbly limestone can be seen. The top of the Pea Grit is an oosparite with large pisoliths. Many of the ooliths have a core of echinoderm bioclast and complete columnals of *Pentacrinus* are present. The pisoliths show a complex history of development and enclose both bioclasts and ooliths within a spongy mass of *Girvanella* tubes. They are very compressed oblate spheroids with the greater diameter generally parallel to the bedding/depositional surface. Many show preferential growth of one side indicating that they were not turned over too often.

The basal part of the overlying Lower Freestone is an oosparite with large crinoid, polyzoan and bivalve bioclasts together with intraclasts of oomicrite. This part of the succession is best shown in the South Quarry where some 30 ft. of cross-bedding sets have steep foresets with a general dip to the south-west. Within these larger units are small scale units representing ripples and small sand waves on the prograding oolith banks. The total thickness of the Lower Freestone is about 130 ft. (Arkell, 1933; p. 203).

At the southern end of the South Quarry the overlying Oolite Marl is accessible (fig. 5, South Quarry). The basal bed is 3 ft. of micrite with some bivalve bioclasts and *Rhaxella* spicules. The next hard band is a pelmicrite with occasional bivalve, gastropod and foraminiferid bioclasts and, locally, concentrations of pisoliths. The upper surface is irregular. The next two hard beds are biopelmicrites with pisoliths. Then follow thicker beds of oomicrite with marly partings forming the top of the Oolite Marl. This formation has long been recognised as a richly fossiliferous deposit, particularly for brachiopods. The Upper Freestone which caps this section is a medium-grained oosparite.

The third section (fig. 5, Top Quarry) is adjacent to the top of the tram-line; it extends from the upper part of the main quarry through the small quarry. The Upper Freestone may be seen in the uppermost part of the main quarry; it is an oosparite with patches of micrite matrix. Some 18 ft. are exposed but the total thickness is about 30 ft. At the top of the Freestone, solution cavities representing former ooliths, now infilled with ferroan calcite in an oosparite with a non-ferroan calcitic primary cement, have been interpreted as

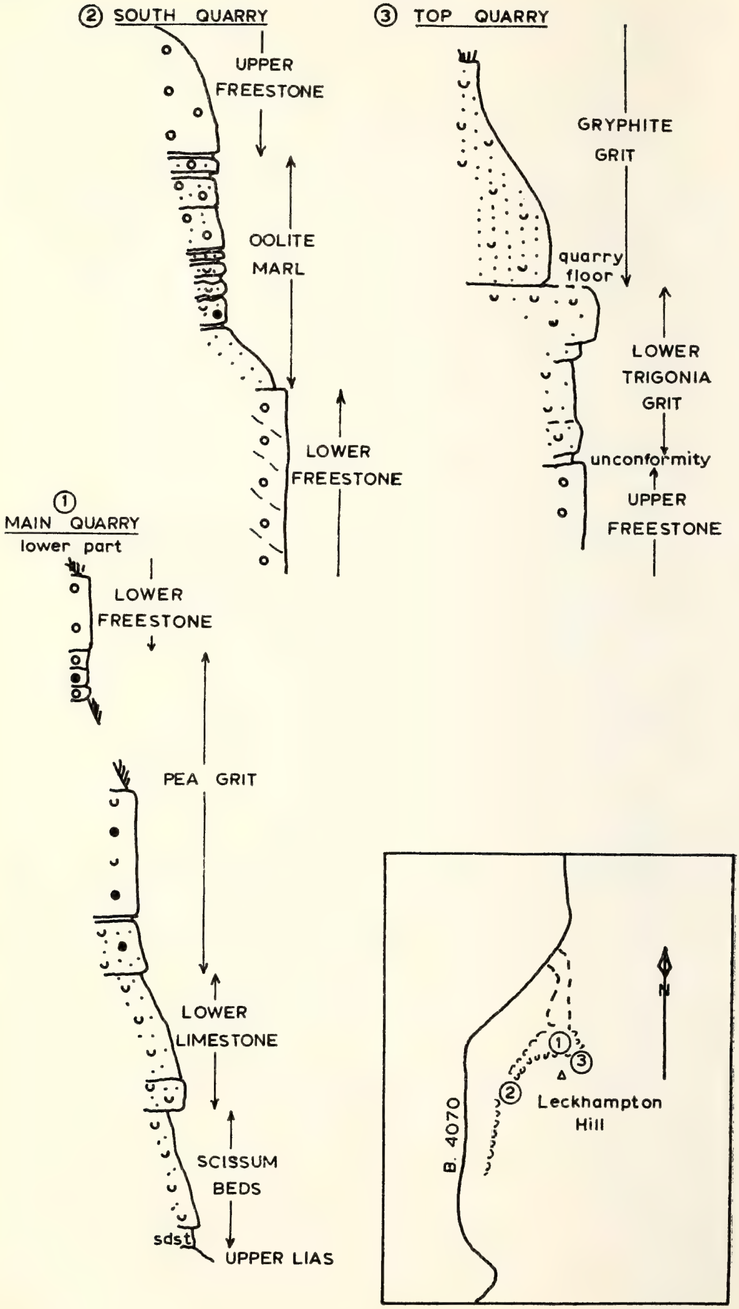
② SOUTH QUARRY
UPPER FREESTONE
OOLITE MARL
LOWER FREESTONE
③ TOP QUARRY
GRYPHITE GRIT
quarry floor
LOWER TRIGONIA GRIT
unconformity
UPPER FREESTONE
①
MAIN QUARRY
lower part
LOWER FREESTONE
PEA GRIT
LOWER LIMESTONE
SCISSUM BEDS
sdst
UPPER LIAS
N
①
③
②
B. 4070
Leckhampton Hill

Fig. 5. Leckhampton Hill. Sketch map and the 3 measured sections (see fig. 2 for key to ornament).

evidence of probable subaerial exposure during the time of the unconformity (M. Talbot, pers. com.).

Between this and the floor of the top quarry are 8 ft. 9 ins. of Lower *Trigonia* Grit. The basal 6 ins. is marly and was regarded by Buckman (1895) as the Harford Sands equivalent. It is followed by a series of ferruginous biomicrites all of which have bioclasts of a bivalve with a prismatic structure (Pterinacea). One softer bed contains chamosite ooliths. The hard band just below the quarry floor has an abundance of small serpulid tube clusters.

In the top quarry proper some 10 ft. 6 ins. of rubbly, highly fossiliferous (*Gryphaea sublobata*) sandy biomicrite complete the section; this is the *Gryphite* Grit.

The detailed succession within the Middle Inferior Oolite was first described by Buckman in 1893 followed by an abridged succession in 1895. The exact spot on Leckhampton Hill which was described remains unknown: there is a large area of disused quarry workings on the hill top. It is difficult to recognise the details of Buckman's subdivisions in the section here described. This is unfortunate as Leckhampton Hill is the type locality of the Lower *Trigonia* Grit and *Buckmani* Grit (see Donovan and Hemingway, 1963). In particular the 11 ft. 8 ins. of sandy limestones of the *Buckmani* Grit cannot be recognised between the Lower *Trigonia* Grit and the *Gryphite* Grit. It is curious that no detailed succession has been described subsequently, not even by Richardson (1904) who described almost every other section available in the Cheltenham district.

This anomaly needs details palaeontological investigation before a final explanation can be offered. However, it is possible that the thicknesses recorded by Buckman were only of very local application and that the two beds of hard ferruginous biomicrite with serpulids, here included at the top of the Lower *Trigonia* Grit, may represent a thinner lateral equivalent of the *Buckmani* Grit.

SUMMARY OF THE STRATIGRAPHY AND THE ENVIRONMENTS OF DEPOSITION

Wherever they are seen the *Scissum* Beds are sandy biomicrites. They rest either on similar deposits (the upper part of the Cephalopod Bed in the region from Wotton-under-Edge to Frocester Hill) or on Upper Lias Clay (Crickley Hill and Leckhampton Hill). In each case the marked increase in carbonate content is probably due to a relative decrease in the supply of clastic material. The abundant bivalve and echinoderm (particularly crinoid) bioclasts indicate a shallow shelf sea.

The Lower Limestone in the Wotton to Selsley Common area is an oosparite, often massive, and sometimes showing both large and small scale cross bedding. It can be interpreted as forming in a shoal, high energy, subtropical to tropical, marine or slightly hypersaline, environment. The ooliths probably formed submarine banks (as indicated by the large scale cross bedding) upon which there were smaller ripples and megaripples (represented by the small scale cross bedding). In the Crickley Hill—Leckhampton Hill area the Lower Limestone is thinner and is represented by biomicrites and biomicrudites indicating open shelf conditions.

The Pea Grit is best developed around Crickley Hill where numerous massive beds of pisolith-bearing biomicrites are to be seen. These beds have long been famous for their rich fauna, particularly of brachiopods and echinoids. The pisoliths may be up to ½ in. or greater in diameter. Many are flattened ellipsoids with a core of bivalve or brachipod shell fragment while others are nearer a spherical form. Their growth is attributed to the activities of the encrusting calcareous alga *Girvanella pisolitica* (Wethered, 1891) and the fact that the coatings completely enclose the core indicates that the pisoliths were periodically rolled over (perhaps during storms). By analogy with modern regions of carbonate sedimentation (e.g. the Trucial coast of Arabia) the presence of echinoids would indicate an open marine environment or close proximity to open sea (as in a bay or at the entrance to a lagoon). Arkell (1933, p. 204) considered the environment to have been a coral reef but corals are not the most conspicuous components of the rock. It seems probable that the environment was sublittoral with perhaps a few feet of water, and that it was too disturbed to allow the development of a continuous algal cover to form a bedded stomatolite but not so disturbed as to prevent the growth of the algae on the bioclasts. This was probably an embayment for to the north and south the pisoliths die out. In the Wotton—Nibley area a Pea Grit "equivalent," usually less than 1 ft. thick, has been recognised but it seems likely that part of the Lower Limestone here is equivalent in age to the Pea Grit of the Crickley area.

The Lower Freestone is typically an oosparite developed on a massive scale particularly at Leckhampton where sedimentary structures are very well shown. Its environment of formation must have closely resembled that of the oosparitic Lower Limestone.

The Oolite Marl consists of an alternation of soft marls and thicker hard bands of limestone. In its southernmost occurrence (Selsley Common) these are biomicrites, with or without ooliths, and oosparites or biosparites sometimes with intraclasts and composite grains. At Leckhampton they are micrites, pelmicrites and oomicrites. On the whole a low-energy shoal, lagoonal environment is indicated (there is some similarity with the outer lagoon at Abu Dhabi, Trucial Coast of Arabia, Murray, pers. observation).

The Upper Freestone is an oomicrite or oobiosparite at Selsley Common and an oosparite at Leckhampton. The environment of deposition was probably similar to that of the other oolites.

No other beds of Lower Inferior Oolite age are exposed in the area under discussion, although they occur in Cleeve Hill to the north. Their absence from the south may be attributed in part to the effects of slight folding followed by erosion and in part due to non-deposition (particularly in the south, see Buckman, 1901). Two erosional phases are recognised; one at the base of the Bajocian and one within the Bajocian (formerly known as the Vesulian transgression). South of Stroud there are no Lower Bajocian deposits (i.e. Middle Inferior Oolite) and the erosion surface is attributed to the mid-Bajocian.

Rocks of Middle Inferior Oolite age are seen at Catbrain Quarry and on Leckhampton Hill. The Lower *Trigonia* Grit consists of ferruginous biomicrites sometimes with chamosite-oolith bands. The *Buckmani* Grit cannot be recognised at Leckhampton but is represented by sands and sandy biomicrites at Catbrain Quarry. The *Gryphite* Grit is a sandy biomicrite rich in *Gryphaea sublobata*. All these formations are thin in the area described here.

Following the Middle and preceding the Upper Inferior Oolite depositional phases there was slight folding accompanied by erosion. This led to the mid-Bajocian unconformity (=Vesulian transgression of some authors) upon which the Upper *Trigonia* Grit rests. Buckman (1901), in a classic piece of mapping and geological deduction, demonstrated that the pre-Upper Inferior Oolite rocks were thrown into a series of very gentle folds with an axial direction varying from N.W.—S.E. (as in the Painswick syncline) to more or less N.—S.

The Upper Inferior Oolite commences with the Upper *Trigonia* Grit, typically a richly fossiliferous biomicrite (*Acanthothyris*, terebratulids, and *Trigonia*) indicating open shelf conditions. However, at Breakheart Hill there are oobiosparites suggestive of shoal high energy conditions, while at Broadway (Dursley) there is a thicker succession of intramicrites indicating a nearby source of reworked intraclasts. A bored surface near the top of the formation in Leigh's Quarry, Selsley Common, indicates a local brief interruption of sedimentation.

By analogy with the succession at Dundry, Richardson (1910) regarded the next band as the Upper Coral Bed. The only localities where this bed could be distinguished is Nibley Knoll and Wotton Hill. However, it is doubtful whether it can truly be correlated with the Dundry succession.

The highest formation is the *Clypeus* Grit. To the south, at Coombe Hill, Wotton, Breakheart Hill and the Broadway, Dursley, it consists of intramicrites, biomicrites and oosparite. The succession is capped with oomicrite or oosparite. To the north, at Stanley Wood, biomicrites appear. On Selsley Common biomicrites and biosparites predominate but intraclasts appear throughout the succession and testify to the erosion of nearby limestones. The *Clypeus* Grit gives evidence of shoaling conditions at the conclusion of Inferior Oolite time.

ACKNOWLEDGMENTS

I should like to thank M. Talbot for introducing me to the staining method. B. Hawkins kindly read the manuscript.

APPENDIX

Grid references of the measured sections:

Coombe Hill Quarry, Wotton-under-Edge ST/768944
Waterworks Quarry, Wotton-under-Edge ST/768943
Wotton Hill, Wotton-under-Edge ST/753938 (south end of quarry)
Nibley Knoll ST/745957
Breakheart Hill Quarry ST/756967
Dursley, The Broadway ST/749978
Stanley Wood Quarry SO/826017
Leigh's Quarry, Selsley Common SO/826025
Quarry 2, Selsley Common SO/829033 (= Quarry 2 of Witchell, 1882).
Quarry 4, Selsley Common SO/832035 (=Quarry 3 of Witchell, 1882)
Catbrain Quarry, Painswick SO/866115
Crickley Hill SO/929159 (above junction of road to Crickley and A417).
Leckhampton Hill SO/939185

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EDITORIAL NOTE

An introduction to the Folk classification of Limestones

THE term limestone embraces all the calcareous sedimentary rocks. This short note is a précis of the classification proposed by Folk (1959, 1962).

Basically limestones are made up of three components: (a) complex carbonate particles (allochems), (b) microcrystalline calcite ooze and (c) sparry calcite cement.

The important allochems are: (1) fossils and shell debris (bioclasts), pellets (spheres or ellipsoids with a microcrystalline internal structure), ooliths (spheres with concentric and radial internal structure), and intraclasts (fragments of penecontemporaneous limestone).

Table 1: Simplified Folk classification of non-dolomitised limestones.
* = rare rock type.

					> 10% allochems		< 10% allochems			
					Sparry calcite cement > microcrystalline ooze matrix	Microcrystalline ooze matrix > sparry calcite cement.	1—10% allochems		> 1% allochems	Undisturbed reefal rocks
					Sparry allochemical rocks	Microcrystalline allochemical rocks				
Volume of Allochem components	> 25% Intraclasts				Intrasparrudite Intrasparite	Intramicrudite* Intramicrite*	Most abundant allochem	Intraclast-bearing micrite*	Micrite; if disturbed, dismicrite	Biolithite
	< 25% Intraclasts	> 25% ooliths			Oosparrudite Oosparite	Oomicrudite* Oomicrite*		Oolite-bearing micrite*		
		< 25% Ooliths	Volume of fossils: pellets	> 3 : 1	Biosparrudite Biosparite	Biomicrudite Biomicrite		Fossiliferous micrite		
				1 : 3—3 : 1	Biopelsparite	Biopelmicrite		Pelletiferous micrite		
				> 1 : 3	Pelsparite	Pelmicrite		Pelletiferous micrite		

The microcrystalline calcite ooze is termed micrite. It probably originated as aragonite mud but has now recrystallised to calcite.

Sparry calcite cement consists of grains or crystals of calcite, usually more than 10 microns in diameter, growing from the allochems into the pore spaces.

In the Folk classification the limestone name is built up from its components. Thus a rock rich in ooliths and having a sparry calcite cement is an *oosparite*. If the ooliths are large it is an *oosparrudite*. Any coarse grained limestone has *rud* added to its name. *Bio* refers to bioclasts, *intra* to intraclasts, *pel* to pellets, *micr* to micrite. The classification of non-dolomitised limestones is shown in table 1.

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ECOLOGY OF DUCKWEEDS AND AZOLLA IN NORTH SOMERSET

By M. C. Smith
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INTRODUCTION

THE five British species of duckweed (*Lemna* spp., *Wolffia arrhiza*) and the naturalized water fern *Azolla filiculoides* share a specialized growth form and often occur in competition with each other. The persistence of all six species implies that each must possess specific competitive advantages which, at some times and in some places, enable the population of that species to increase relative to the other five. The aim of this study, conducted in 1967, is to identify some of these advantages.

Clatworthy (1960), whose observations are discussed by Harper (1961), measured growth rates of *Lemna gibba* and *L. polyrhiza* in single species and mixed cultures and found that the growth rate of each decreased when in competition with the other, that of *L. polyrhiza* declining by the greater amount. The relative success of *L. gibba* was attributed to greater buoyancy.

Possible competitive advantages which have been the subject of the present investigation relate to:—

1. Survival in winter;
2. Length of growing season;
3. Tolerance of low light intensities;
4. Relative buoyancy;
5. Drought resistance;
6. Rates of growth on open water.

Although other factors no doubt operate (in particular tolerance of low mineral status, relative extent of animal and fungal attack, and degree to which saprophytic nutrition occurs), the changes in composition of populations of duckweeds, as observed in ditches, as well as experimentally, can be largely explained in terms of the features listed.

North Somerset is the most favourable area in Britain for a study of competition between duckweeds. All five species are common here. Kent, Sussex and Wiltshire are the only other counties in which *Wolffia* has been recorded since 1930 (Perring and Walters, 1962), but in none of these counties does there exist so extensive an area of suitable habitats for duckweeds as that provided by the drainage ditches and peat diggings in the low-lying ground to the north and south of the Mendips. Most such ditches, except the widest or most rapidly flowing, are by June entirely covered by duckweeds, often in association with *Hydrocharis morsus-ranae*, *Callitriche* spp. and *Potamogeton* spp.

OCCURRENCE AND ECOLOGICAL BEHAVIOUR OF DUCKWEEDS

Relative Abundance

Seventy-six sites within the area bounded by Clevedon, Burnham and Glastonbury at which at least one species of duckweed occurred were examined in July 1967. The sites were in roadside ditches at locations at least half a mile apart. Samples were scooped up in a net, and the proportion (by bulk) of each species was subjectively estimated. The average composition was *L. minor* 49%, *L. trisulca* 20%, *L. polyrhiza* 18%, *L. gibba* 11%, and *Wolffia* 2%. In total 210 occurrences of species were observed, of which 35% were of *L. minor*, 24% *L. polyrhiza*, 18% *L. trisulca*, 14% *L. gibba*, and 9% *Wolffia*. It is apparent that when *L. minor* occurs with other species it is, in general, more abundantly represented, whereas when *Wolffia* and *L. polyrhiza* occur in mixed colonies they are less well represented than other species.

At twelve sites only *L. minor* occurred, and at three sites only *L. trisulca*. All five species occurred together at three sites (all near Kingston Seymour). *Wolffia* is particularly abundant in some ditches in this area, accounting for up to 30% of the bulk of colonies. Additionally *Azolla filiculoides* was recorded from one site, and the floating liverwort *Riccia fluitans* from two. The occurrence of *Azolla* is sporadic. For example in September 1965 it dominated 200 yards of a ditch at Loxton to the virtual exclusion of other species, whereas in 1966 and 1967 no plants of *Azolla* could be found at the site.

Survival in Winter and Length of Growing Season

Observations made in Spring 1967 (following a mild winter) are summarized in Table I.

Table I. Appearance of Duckweeds and *Azolla* in Spring, 1967

	19 March	23 April	30 April	17 June
L. gibba	Floating*	As in March	Becoming more gibbous	Fully gibbous, purple
L. minor	Floating†	As in March but all fronds sprouting	As at 23 April	Bright green clusters
L. polyrhiza	Not on surface	Kidney-shaped rootless green-black turions, floating	Turions mostly sprouting	Dark green clusters, red below
L. trisulca	Floating abundant	As in March	As in March	As in March
Wolffia	No sites examined	A few on surface	A few on surface	Increasingly abundant
Azolla	No sites examined	No sites examined	No sites examined	Very small dark green plants

*Frequent as either (1) pale green gibbous clusters, or (2) dark green non-gibbous single fronds sprouting pale green fronds.

†Generally occurring as bright green clusters similar to the summer form, but occasionally as elliptical purple rootless single fronds.

These observations suggest that *L. minor* and *L. trisulca* generally pass the winter in floating unspecialized form, *L. gibba* in a floating but specialized form, *L. polyrhiza* in a submerged specialized form and *Wolffiia* in a submerged but unspecialized form. *Azolla* generally overwinters as spores—although instances of *Azolla* overwintering vegetatively have been recorded from the area (Willis, 1967).

Rough comparison of relative abundance at the beginning and end of the growing season suggests that the greatest increase is shown by *Azolla*, followed by *Wolffia*, *L. gibba*, *L. polyrhiza*, and *L. minor*, with *L. trisulca* showing the least increase. The species may therefore occur in the same order with regard to extent of winter mortality.

The order in which growth commences in Spring is *L. gibba*, followed by *L. minor* and *L. trisulca*, then by *L. polyrhiza* and *Wolffia*, with *Azolla* last.

Tolerance of Low Light Intensity

Two investigations were made which suggest that tolerance of low light intensity decreases in the order *L. trisulca*, *L. minor*, *L. polyrhiza*, *L. gibba* and *Wolffia*. The position of *Azolla* is uncertain.

(i) In a survey of sites in July the degree of shading by trees and reeds was subjectively allotted to one of two levels, as shown in Table II.

Table II. Number of sites at which Duckweeds present

	L. gibba	*L. minor*	*L. polyrhiza*	*L. trisulca*	*Wolffia*	Total
Open	21	42	33	18	15	42
Some shade	8	31	18	20	4	34
Total	29	73	51	38	19	76

Wolffia, *L. gibba* and *L. polyrhiza* are associated with unshaded sites; the association is statistically significant (on applying chi squared contingency tests) at the 0·05 confidence level for the first two, and at 0·10 for *L. polyrhiza*. *L. minor* and *L. trisulca* are relatively more tolerant of shade.

(ii) Separate colonies of each species were grown in jars at different distances from a mercury vapour lamp. (Since tap water was used without addition of minerals, growth rates, especially at the higher light intensities, were probably lower than the rates achieved in ditches. Moreover, light intensity from a lightly clouded sky in summer at noon is over double the greatest intensity in this experiment). The experiment was continued for six weeks, but initial frond numbers were based on a count a week after setting up, to allow for acclimatization, and the counts for the last week, when mineral deficiency appeared to have become pronounced, were not used.

Table III. Percentage increase in frond number in 28 days

Light Intensity (Lumens /sq. ft.)	*L. minor*	*L. gibba*	*L. polyrhiza*	*L. trisulca*	*Wolffia*	*Azolla*	Average
480	145	137	70	112	93	51	101
225	77	88	58	79	7	142	75
138	64	54	37	37	—11	40	37
114	32	39	19	52	4	13	27
45	—2	—13	—6	10	—10	10	—2
14	—17	—13	—7	6	1	—17	—6
4	—17	—6	—14	2	—6	—8	—7

The results of Table III suggest that the photosynthetic compensation point of *L. trisulca* may be below the average of the six species, and that of *Wolffia* above it. No difference between the compensation points of the other species of *Lemna* was apparent. Shortage of minerals may have reduced rates of growth at the higher light intensities relative to rates of growth in weak light, the extent of the effect being greater with the faster growing species.

Relative Buoyancy

When the plants in a colony become crowded the species with greatest buoyancy will shade the other species. Relative buoyancy was investigated by placing a mixture of species of known composition (and containing approximately equal bulk of each species) in a half-filled 10 gallon carboy so that the water surface was just covered. The water level was gradually raised until, as the level rose up the sloping sides of the carboy, the surface area was reduced about three times. After gentle shaking, the composition of the layer visible from above was then estimated. The procedure was repeated with further reductions of surface area. Results, after conversion of actual percentage compositions of each species in the sample to equality, are shown in Table IV.

Table IV. Percentage of total frond number due to each species*

	Azolla	*L. gibba*	*L. minor*	*L. polyrhiza*	*L. trisulca*	*Wolffia*	Total
Total sample	16·7	16·7	16·7	16·7	16·7	16·7	100
Surface covered	18·9	17·4	23·0	26·2	0	14·7	100
Surface reduced to 1/3 ..	27·0	19·2	16·9	30·9	0	6·0	100
Surface reduced to 1/9 ..	34·7	32·2	7·8	19·0	0	6·3	100
Surface reduced to 1/27 ..	65·5	18·9	3·1	9·8	0	2·7	100

*Figures are given to nearest 0.1

The relative buoyancy of the species declines in the order *Azolla*, *L. gibba*, *L. polyrhiza*, *L. minor*, *Wolffia*, and *L. trisulca*.

Resistance to Drought

Plants of each species were placed on the surface of a slurry of mud and water, which was then allowed to dry until cracks appeared. The mud was remoistened, and then examined at intervals. After three days all specimens of *Azolla* seemed dead; some of *L. gibba* and *Wolffia* seemed dead: all *L. minor* and *L. trisulca* appeared alive, but no growth had taken place; some specimens of *L. polyrhiza* had formed new fronds.

Rates of Growth on Open Water

In order to determine the relative rates of growth of the different species when there is no crowding on the surface each species was grown under the same conditions of good lighting and mineral status.

No significant differences were observed between the rates of growth of the different species of duckweed, but in one experiment the rate of growth of *Azolla* was greater than the average for all the species by an amount that is significant at the 10% level, as shown in Table V.

Table V. Rates of growth on open water

	L. gibba	*L. minor*	*L. polyrhiza*	*L. trisulca*	*Wolffia*	*Azolla*
Number of fronds at 30 July ..	45	38	32	34	50	42
Number of fronds at 23 August	106	112	77	65	111	187
Percentage increase ..	136	195	141	91	122	345

However, in a replicate experiment *Azolla* showed the lowest growth rate, apparently due to fungal attack.

Competition under Experimental Conditions

The species were grown for 55 days under controlled conditions of light (intensity averaging 656 lumens/sq. ft., from a mercury vapour lamp) and temperature (maintained approximately constant at 70°F. by carrying out the experiment in a shuttered basement), using a mineral medium (containing N, K, P, Fe, Mg, Ca, S and trace elements) sufficiently rich for no significant fall in composition to occur due to uptake during growth. To eliminate the effect of variations in conditions due to slight differences in distance from the lamp, the colonies were arranged in two 5 × 5 Latin Squares composed of compartments of 0·55 inches square and 1·5 inches depth.

In one Latin Square each species was grown in isolation. Growth curves are plotted in Figure 1 as solid lines. The curves of *L. polyrhiza, L. trisulca, L. gibba* and *L. minor* show uniform and high initial rates but indicate lower growth rates as the fronds become crowded and overlapping. The order in which this reduction took place, which is as above, reflects the relative site of the fronds of these species. The curve for *Wolffia* also shows an eventual reduction of growth compared with the initial rate but, since this species did not completely cover the surface even after 55 days, the reduction must be due to some factor other than crowding. (The experimental conditions do not seem to have been favourable to the growth of *Wolffia*, and the results relating to it in this and the next two experiments do not fit with the observations below made at Street).

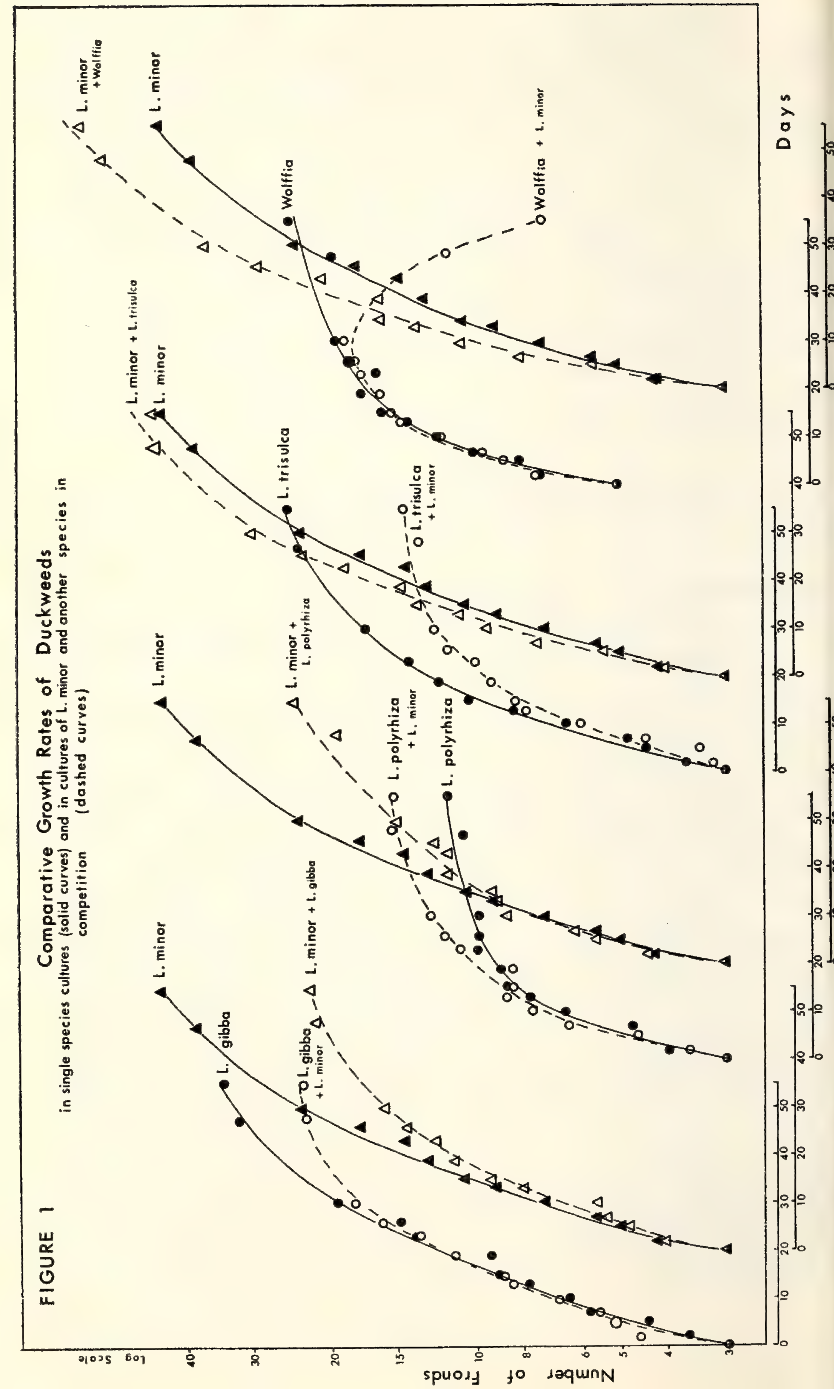

FIGURE 1

Comparative Growth Rates of Duckweeds

in single species cultures (solid curves) and in cultures of L. minor and another species in competition (dashed curves)

In the second Latin Square each species was grown in competition with *L. minor*. Growth curves are plotted in Figure 1 as dashed lines, alongside the growth curves of single species cultures. The relative form of the curves suggests that:

(i) *Wolffia* and *L. trisulca* do not reduce the growth rate of *L. minor*, but their own growth rates are curtailed if *L. minor* is present.

(ii) When *L. gibba* and *L. minor* are in competition the growth rate of each is reduced, that of *L. minor* falling more than that of *L. gibba*.

(iii) When *L. polyrhiza* and *L. minor* are in competition the growth of *L. polyrhiza* is not reduced whereas that of *L. minor* is. (The fact that the growth of *L. polyrhiza* when in competition was faster than in isolation was presumably due to differences in the vigour of the specimens selected).

Also in the second Latin Square all five species were grown in competition. As shown in Table VI the growth rate of each species was lower, compared with its growth in single species culture, when subjected to simultaneous competition from the four other species. The extent to which growth rate was reduced by competition with four other species was least in the case of *L. polyrhiza* and then increased in the order *L. minor*, *Wolffia*, *L. gibba* and *L. trisulca*.

Table VI. Comparison of growth rates in single species cultures and in cultures of five species in competition

	L. gibba	*L. minor*	*L. polyrhiza*	*L. trisulca*	*Wolffia*
(1) Frond number after 55 days in single species culture	33·8	45·2	11·6	24·4	24·2
(2) Frond number after 55 days in competition ..	8·6	22·8	8·4	4·8	7·2
(2) as % of (1)	25·4	50·4	72·4	19·7	29·7

Observations near Street

Four sites were examined at intervals during the growing season and counts of each species made (Table VII).

Sites 1, 2 and 3 were in a stagnant ditch. Site 1 was 1 yard up-wind (with regard to prevailing wind) of a *Glyceria* clump blocking wind-blown movement of duckweeds. Sites 2 and 3 were respectively 33 and 70 yards up-wind of the obstruction. Site 4 was in a peat digging protected from wind. All site surfaces were covered with overlapping fronds at each date except Site 3 in April which had 50% of the surface clear. By September Sites 1 and 2 had partially dried out and contained a slurry of mud and water.

Table VII. Fronds per square inch of surface

Grid. Ref.	Site	Date	*L. gibba*	*L. minor*	*L. polyrhiza*	*L. trisulca*	*Wolffia*
ST/458386	1	30 Apr.	—	497	9	267	—
		17 June	—	750	61	414	—
		9 Sept.	—	187	61	72	—
ST/458386	2	30 Apr.	—	31	27	94	—
		17 June	—	71	138	308	—
		9 Sept.	—	193	128	46	—
ST/458386	3	30 Apr.	—	10	2	172	—
		17 June	—	71	98	651	—
		9 Sept.	8	603	92	164	—
ST/464394	4	30 Apr.	7	252	—	144	15
		17 June	31	1355	—	950	60
		9 Sept.	38	605	—	630	468

The changes in relative abundance of species can be tentatively explained in terms of investigated competitive advantages as follows:

> In April the abundance of *L. trisulca* and *L. minor* was due to their superior winter hardiness. Moreover, some plants of *Wolffia* and *L. polyrhiza* had not yet risen to the surface.
>
> Between April and June *L. minor* increased at each site, on average by 307%. Increase in *L. trisulca* was a little smaller, averaging 252%, due to shading by surface-growing species. Increases in *L. polyrhiza* and *L. gibba* were greater than for *L. minor*, due to superior buoyancy.
>
> Between June and September *L. minor* decreased substantially at Site 1, due to poor resistance to dehydration, whereas the more resistant *L. polyrhiza* maintained its numbers.

The reason for the marked increase in *Wolffia* at Site 4 over the whole period is not known. *Wolffia* was found in experiments to be less buoyant and less shade tolerant than *L. minor* which dominated the site.

DISCUSSION

The order of performance of the species with respect to five competitive advantages investigated, together with the order of performance in competition under experimental conditions, is summarized in Table VIII.

Table VIII. Order of performance

	Azolla	*L. gibba*	*L. minor*	*L. polyrhiza*	*L. trisulca*	*Wolffia*
Survival in Winter	6	4	2	3	1	5
Early growth in Spring	6	1	2½	4½	2½	4½
Shade tolerance ..	(3½)	5	2	3½	1	6
Buoyancy	1	2	4	3	6	5
Drought resistance ..	6	4½	2½	1	2½	4½
Competition under experimental conditions	(3½)	5	2	1	6	3½

Since an order of performance for *Azolla* was not established for two of the criteria it has been assigned an average position (of 3½) for these.

A broad correlation exists between the average order of performance by a species in respect of the criteria above and the relative frequency of occurrence (Table IX).

Table IX. Comparison of order of performance and frequency of occurrence

	L. minor	*L. polyrhiza*	*L. trisulca*	*L. gibba*	*Azolla*	*Wolffia*
Average order of performance ..	2·5	2·7	3·2	3·6	4·3	4·7
Order of relative frequency in N. Somerset ..	1	2	3	4	6	5
Order of relative frequency in U.K.*	1	4	2	3	5	6

*As assessed by number of 10 Km. squares in which recorded since 1930 (Perring and Walters, 1962).

Among the more important competitive advantages and disadvantages associated with particular species are:

L. minor	High winter survival and shade tolerance.
L. gibba	Buoyancy and early growth in spring.
L. polyrhiza	Drought resistance and buoyancy.
L. trisulca	High winter survival and shade tolerance, but lack of buoyancy a disadvantage.
Azolla	Buoyancy; poor winter survival a disadvantage.

The nitrogen-fixing blue-green alga *Anabaena* occurs within the leaf-lobes of *Azolla*, and *Wolffia* appears to be favoured by water with a high content of organic matter. It is therefore possible that two competitive advantages not discussed here are of importance—namely, tolerance of low mineral status and perhaps capacity for saprophytic nutrition.

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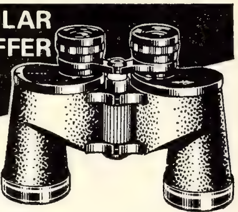

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Anyone interested in Natural History may apply to join the Society as a Full member. The annual subscription is 25/–. Members of the household of a Full member and persons residing outside a radius of twenty miles from the City Centre of Bristol may become members for an annual subscription of 12/6. There are also membership facilities for persons still undergoing educational instruction or still under the age of 21 years at the reduced subscription of 12/6. A prospectus giving fuller details of the privileges of the various classes of membership may be obtained from the Honorary Treasurer:—

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The Society has stocks of back numbers of most annual parts of the *Proceedings* which may be purchased at the price of 5/– per part (except parts of Vol. XXX which are 8/– and of Vol. XXXI which are 15/–), postage extra. Application should be made to the Honorary Librarian, Bristol Naturalists' Society, City Museum, Bristol 8.

In addition, the undermentioned papers from the *Proceedings* may be obtained from the Honorary Librarian:—

A Revised List of the Birds of the Bristol District by H. H. Davis, reprinted from *Proc.*, 1947. Price 5/–, postage extra.

A Centenary History of the Bristol Naturalists' Society 1862–1962, being Part IIIA of *Proc.*, 1961. Price 5/–, postage extra.

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1969

PROCEEDINGS

OF THE

Bristol Naturalists' Society

EDITED BY J. W. COWIE
ASSISTED BY A COMMITTEE

"Rerum cognoscere causas"—Virgil

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1971
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DR. J. W. COWIE,
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NOT LATER THAN FEB. 28.

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1. All matter offered for publication in the "Proceedings" must be sent as directed on p. 2 of cover of current issue.
2. To ensure consideration for inclusion in the next issue, contributions must be received not later than February 28.
3. All copy must be type-written (preferably double-spaced) or in very clear manuscript and, in either case, with good margins.
4. Copy submitted is not returnable and authors are advised to keep a duplicate.
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REPORT OF COUNCIL, 1969

THE membership at the end of the year was 765 including 71 juniors. There are 16 affiliated societies.

The Annual General Meeting re-elected R. Bradshaw as President and elected the other Officers and Members of Council. General meetings have been well supported, some having a large attendance. Numbers at Sectional meetings have also improved during the year. The Annual Dinner was again held successfully in the Senior Common Room, after which the Guest Speaker, Mr. W. O. Copland gave an illustrated talk on Nature Conservancy in the South-West of England during the past five years.

The Conservation Committee has diligently continued its work to the good of all, making numerous representations and establishing contact with public authorities and private organisations. Proposals for our area to mark the 1970 European Conservation Year include a Nature Trail in Ashton Court Grounds. It is hoped the Society will support their efforts. Mr. K. T. Batty has agreed to be Chairman from March, 1970.

With respect and regret we have to record the deaths of Mr. W. A. Geary, Mr. I. W. Evans and Mr. G. C. Bush.

GWYNNETH STERNE, *Hon. Secretary.*

LIBRARIAN'S REPORT, 1969

Exchange of the Proceedings has been discontinued with the following:—Ashmolean Natural History Society of Oxfordshire, Barrow Naturalists' Field Club, Belfast Naturalists' Field Club, Cheltenham College Natural History Society, Croydon Natural History and Scientific Society, Cotteswold Naturalists' Society, Llandudno and Colwyn Bay Field Club, Manchester Microscopical Society, Marlborough College Natural History Society, Swansea Scientific and Field Naturalists' Society, Academy of Sciences of St. Louis.

65 books and 90 periodicals were borrowed by 49 members.

R. BRADSHAW, *Hon. Librarian.*

REPORT OF ENTOMOLOGICAL SECTION, 1969

AT the General Meeting on 14 January the following were elected: President, T. B. Silcocks; Vice-President, P. F. Bird; Secretary, A. D. R. Brown; Assistant Secretaries, R. Dransfield and C. W. Wiltshire; Committee, D. G. Gibb, A. Kennard and K. H. Poole.

During 1969, the following meetings took place:

Mar. 11:	Talk on the Lepidoptera of S. W. England by A. Kennard.
June 11:	Branscombe, South Devon. Mr. A. D. R. Brown.
July 5:	Walton Hill, Clevedon. Mr. T. B. Silcocks.
Aug. 23:	Inglestone Common, Glos. Dr. C. E. D. Smith, Mr. D. G. Gibb and Mr. R. E. Knight.
Oct. 7:	Conversazione at Mr. A. D. R. Brown's home.
Nov. 4:	Annual Exhibition at the City Museum.

A. D. R. BROWN, *Hon. Secretary.*

The Hon. Treasurer in account with the Bristol Naturalists' Society

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31 DECEMBER, 1969

Dr.

1968 £ s. d.			£ s. d.	£ s. d.	£ s. d.
	Members' Subscriptions:				
659 2 6	Full Members	1968	3 15 0		
		1969	616 13 6		
		1970	32 15 0	653 3 6	
63 14 6	Full Members of the same household	1969	66 12 6		
		1970	4 0 0	70 12 6	
16 5 0	Corresponding Members	1969	15 0 0	15 0 0	
24 7 6	Associates	1969	20 2 6		
		1970	12 6	20 15 0	
21 10 6	Juniors	1969	24 7 0		
		1970	1 17 6	26 4 6	
21 10 0	Affiliated Societies	1968	2 10 0		
		1969	24 0 0		
		1970	2 0 0	28 10 0	
806 10 0					814 5 6
10 2 6	Donations				
237 12 10	*Proceedings* (1967/8):				
	Grants, authors' contributions, donations		54 12 6		
	Offprints		48 12 4		
	Subscribers		16 6 2		
	Advertisements		44 7 8		
1,054 5 4					163 18 8
6 4 0	Sale of Badges				5 6 0
2 3 0	Profit on Dinner				8 0
16 6	Interest on deposit in Post Office Savings Bank				17 0
27 10 0	Interest on National Development Bonds and Premium on conversion				32 6 8
1,090 18 10					1,017 1 10
1 15 0	Members' contributions to "Harry Savory" Fund				5 0 0
932 5 11	Balance from last account				671 8 0
£2,024 19 9					£1,693 9 10

Cr.

1968 £ s. d.			£ s. d.	£ s. d.
185 0 9	General Printing and Stationery		189 3 7	
122 19 7	Postages and Telephone		149 12 8	
15 0	Cheque books, etc.		10 0	
11 0 0	Clerical assistance		12 0 0	
21 19 0	Purchase of typewriter		—	351 6 3
341 14 4				
590 3 6	*Proceedings* (1968, including offprints)			575 15 0
25 4 0	Books		5 4 0	
20 0 0	Bookbinding		—	
35 14 0	Subscription for journals, etc.		36 4 0	
1 0	Rent (of library room)		1 0	
4 19 0	Fire Insurance (library)		—	41 9 0
	Contributions:			
6 5 0	Council for Nature, etc.		6 5 0	
18 0 0	Steep Holm Trust		—	6 5 0
16 1 0	Fares and expenses of general meetings			22 9 0
1 1 5	Field Committee: excess expenditure			1 1 3
85 0 0	Grants to Sections:			
	Botanical		15 0 0	
	Entomological		15 0 0	
46 19 9	Geological		15 0 0	
	Mammal		10 0 0	
	Ornithological		30 0 0	
	Junior		10 0 0	95 0 0
1,144 3 3				1,093 5 6
209 8 6	1967 Film Show: balance of expenses paid			—
	1970 Film Show: prepayment			18 7 6
	Balances to next account:			
46 19 9	Cash in bank	72 12 10		
	less unpresented cheque	15 0 0		
			57 12 10	
34 0 1	Deposit in Post Office Savings Bank		34 17 1	
200 0 0	*£200 5½% National Development Bonds		200 0 0	
330 0 0	*£30 5% National Development Bonds		30 0 0	
	£200 7% British Savings Bonds		200 0 0	
60 8 2	In hands of Field Committee		59 6 11	581 16 10
£2,024 19 9				£1,693 9 10

*Including the "Harry Savory" Illustrations Fund, £47 7s. 6d.

NOTE.—These accounts do not record balances held by sectional treasurers and the Ornithological Section Special Fund of £78 12s. 6d.

REPORT OF BOTANICAL SECTION, 1969

AT the Annual General Meeting in the Small Geology Lecture Theatre of the University on 27 January, 1969, the following officers were elected:—President, Dr. T. E. T. Bond; Secretary and Treasurer, Miss I. F. Gravestock; Committee: Mrs. C. H. Cummins, Mrs. N. Vaughan Davies, Dr. A. F. Devonshire, Mr. J. A. Eatough, Mr. P. J. M. Nethercott, Dr. D. H. Peregrine, Miss A. M. Sampson and Dr. C. E. D. Smith.

The wild plant table at the Bristol Museum continued to be much appreciated, and thanks are offered to Mr. A. Warhurst and Mr. P. F. Bird of the Museum and to Mr. E. S. Smith and Mr. and Mrs. C. H. Cummins, as well as to all members who contributed specimens.

The following winter meetings were held during the year:—

Jan. 27: Annual General Meeting and a further Progress Report on the Somerset Flora by Capt. R. G. B. Roe; also Members' Evening.

Feb. 24: Plant Hunting in Kashmir, by Mr. Ivor B. Barton.

Mar. 17: Film Evening (1) In Search of an English Garden, by Fisons Ltd. for the National Gardens Scheme; (2) Transparencies of a holiday at La Crave by Mr. C. H. Cummins.

Oct. 27: Members' Evening, with transparencies.

Nov. 24: Report of the Survey of Semi-Natural areas in Somerset, by Dr. C. E. D. Smith.

The following field excursions took place, under the leadership of those shown:—

Mar. 8: Goblin Combe, for *bryophytes*. Mrs. J. Appleyard.

April 26: North Stoke and Pipley Bottom. Mrs. N. Vaughan Davies.

May 3: Old Down Gardens and Down House, Tockington. By courtesy of Mrs. R. Bernays. Miss I. F. Gravestock.

June 4: Kingsweston Down. Mr. P. J. M. Nethercott.

June 7: Hawkesbury Upton to Lower Kilcott. Mr. C. H. Cummins. Abundance of *Paris quadrifolia* found, some with leaves, in whorls of 5, 6 or 7. Also *Aquilegia vulgaris*, white form.

June 21: Cadbury Camp to Portishead. Mr. P. J. M. Nethercott.

June 28: Woods East of Tickenham. Mr. E. S. Smith.

July 9: Dundry and Highridge. Dr. A. F. Devonshire.

July 15: The Peat Bog, Trelleck. Dr. D. H. Peregrine.

July 26: Thornbury to Aust. Dr. A. F. Devonshire.

August 16: Wick Rocks. Mr. P. J. M. Nethercott.

September 27. Fungus foray to Prior's Wood, Portbury. Dr. T. E. T. Bond. Profusion of *Armillaria mellea*, and good collections of *Agaricus silvicola*, *Fistulina hepatica* and *Geastrum triplex*.

October 18: Westonbirt Arboretum, Mr. P. J. M. Nethercott,

I. F. GRAVESTOCK *Hon. Secretary.*

REPORT OF JUNIOR SECTION, 1969

THE Committee for 1969 was Dr. C. E. D. Smith (President), Miss D. M. Bussell (Secretary until October), Miss E. J. Lenton, Mrs. A. J. Hollowell, Mr. R. Curber, Mr. A. F. Jayne.

There was an active programme of winter indoor meetings, and outdoor meetings all through the year. Outstanding meetings were the January visit to Cardiff Museum, and the two weekend meetings—a Welsh Weekend in April, and a Dorset Weekend in August.

Outside achievements were that the second edition of *Animag* was edited by P. Cook. Several parties were organized for Conservation Corps work in Long Wood (Somerset) and Wetmoor (Glos.) Nature Reserves.

C. E. D. SMITH, *President.*

REPORT OF GEOLOGICAL SECTION, 1969

THE Annual Business Meeting of the Section was held on 16 January, 1969 in the Geology Lecture Theatre. The following officers were elected: President, Mr. C. E. Leese; Vice-President, Mr. I. H. Ford; Hon. Secretary, Mr. A. B. Hawkins; Hon. Field Secretary, Mr. D. Hamilton; Committee, Professor D. L. Dineley, Student President of the University Geological Society (both *ex-officio*), Mr. D. Addison, Mr. R. Bradshaw, Mr. A. E. Frey, Mrs. M. Scawin, Mr. R. W. Ashley, Mr. N. H. Hollingsworth.

After the Meeting, the retiring President, Mr. I. H. Ford, gave a lecture entitled 'Minerals and the Polarizing Microscope'. Other lecture meetings were:—

20 March: Geological Work in the China Clay Industry. Mr. C. M. Bristow.

23 October: Techniques in Geological Photography. Mr. E. W. Seavill.

27 November: Opencast Coal Mining. Mr. G. Walton.

The following four field meetings took place:—

20 April: The William Smith Locale, leader, Mr. R. Bradshaw.

1 June: Winscombe and Dulcote, leader, Mr. C. E. Leese.

29 June: Vale of Neath, leader Mr. T. R. Owen.

13 July: Pleistocene of the Cotswolds, leader, Mr. A. B. Hawkins.

A. B. HAWKINS, *Hon. Secretary.*

REPORT OF ORNITHOLOGICAL SECTION, 1969

THE WREN
THE WREN
THE KING OF
ALL BIRDS

AT the 45th Annual General Meeting in January, Mr. G. A. Forrest and Mr. S. M. Taylor were elected as President and Secretary respectively. Mrs. J. Campbell (née Adam) and Miss M. Denison had resigned from the Committee on leaving Bristol. Messrs. A. D. Lucas and H. R. H. Lance were elected, and Miss C. Graham, Mrs. C. Hughes and Messrs. A. E. Billett, P. J. Chadwick, H. R. Hammacott, M. A. Ogilvie, J. F. Rowe and D. Warden were re-elected. Mr. A. E. Billett was re-appointed Hon. Auditor.

Seven indoor meetings were held, with an average attendance of 81, the lowest (39) on November 21 and the highest (125) on October 8. The subjects and speakers were:

Jan. 17: A.G.M. The How and Why of Counting Birds, by Mr. M. A. Ogilvie.
Feb. 21: Birds in a Surrey Oakwood, by Dr. G. Beven.
Mar. 19: Foula, its History, People and Birds, by Mr. E. E. Jackson.
Oct. 8: Films—Wild Wings, Water Birds, Wild Highlands and Between the Tides.
Nov. 7: St. Kilda Seafarer, by Dr. J. J. M. Flegg.
Nov. 21: Annual Fieldwork Meeting.
Dec. 10: Islay, by Mr. M. A. Ogilvie; a Morning Walk in S.W. Spain, by Mr. S. M. Taylor; A visit to the Camargue, by Mr. P. J. Chadwick.

Field meetings were held at the Clevedon coast (Jan. 12), Steart (all-day, Mar. 23), St. George's Wharf (May 7), Chittening Warth (May 15), Inglestone Common (May 17), Shirehampton Park and Horseshoe Bend (May 22), the Midford district(May 31), Chittening Warth (Nov. 2) and St. George's Wharf (Dec. 14).

We are grateful to the leaders and helpers on these occasions, and to members who have provided overnight hospitality for visiting speakers and have subsidised our activities in other ways.

Members continued co-operative studies of birds of prey, work on the B.T.O. Atlas of Breeding Distribution, the Common Birds Census, Nest Record Scheme, breeding season census of Shelduck and informal survey work along the R. Avon. There is room for more members, skilled and unskilled, to join in all these activities.

S. M. TAYLOR, *Hon. Secretary.*

REPORT OF MAMMAL SECTION, 1969

AT the Annual General Meeting on 16 January, 1969 Mr. A. F. Jayne was elected President; Mrs. A. R. Holeton Hon Secretary; Miss E. J. Lenton Hon. Field Secretary; Mr. R. G. Symes Mammal Recorder; Messrs. R. M. Curber, F. H. Rawlings and Kevin Cook, Committee Members, and Dr. D. H. Peregrine, Library Committee member.

The following field meetings were held:—

Jan. 19: Fox Spotting. Leader: Mrs. A. R. Holeton. Six foxes were sighted within the city boundaries between 12 midnight and 2 a.m.
Feb. 2: Brockley Combe Survey. Leader: Mr. F. H. Rawlings.
Mar. 1: Portishead to Clevedon Survey. Leaders: Miss E. J. Lenton and Miss M. Crichton.
Apr. 5: Shiplate Slait Survey. Leader: Mr. T. B. Silcocks.
May 4: Wetmoor Survey. Leader: Mr. A. F. Jayne. Yellow-necked mice were recorded.
June 1: Velvet Bottom Survey. Leader: Mrs. A. R. Holeton.
June 22: A River Walk. Leaders: Miss E. Hurrell and Mr. A. F. Jayne.
July 12: Cheddar Wood Survey. Leader: Mr. R. M. Curber. Yellow-necked mice were recorded.

Aug. 2: Midger Wood Survey. Leaders: Mr. R G. Symes and Mr. A. F. Jayne. Yellow-necked mice were recorded.

Sept. 6: Wetmoor Survey. Leader: Mr. E. G. Symes.

Oct. 3-5 Pembrokeshire Weekend. Leader: Miss E. J. Lenton.

Oct. 12: River Yeo Survey. Leader: Mr. R. G. Symes. Mink droppings were found.

Nov. 2: Bourton Combe Survey. Leader: Mrs. A. R. Holeton. A water shrew was caught in a live trap.

Dec. 7: Avon Gorge Survey. Joint meeting with Junior Section. Leaders: Mr. R. M. Curber and Kevin Cook.

Lecture meetings included:—

Feb. 11: The Yearly Cycle of the Grey Seal by Professor H. R. Hewer.

Mar. 11: Mink by Mr. R. J. Clark.

Nov. 4: Urban Foxes by Mr. I. Beames.

Dec. 11: Polecats by Mr. K. C. Walton.

A large number of records has been received for the mammal survey. During 1970 the emphasis will change from general distribution to projects and observations on species of particular interest.

A. R. HOLETON, *Hon. Secretary.*
E. J. LENTON, *Hon. Field Secretary.*

ACCOUNT OF THE GENERAL MEETINGS, 1969

AFTER the elections at the 106th Annual General Meeting on 23 January Mr. R. Bradshaw gave an illustrated talk entitled "Noah's Flood" giving some thoughts on the Bible story but also showing a considerable amount of research is still required.

On February 6 J. A. Eatough showed some of his slides on Mendip Caves, including a unique series of the discovery and exploration of St. Cuthberts Swallet from 1953 onward before some of the caves were quarried away.

On March 6 the "Effects of plants on weather" was the subject taken by Prof. J. P. Hudson.

On October 2 Dr. E. Neal spoke about his recent trip to Queen Elizabeth Park, Uganda, when he spent four months working at the research centre. He successfully studied the banded mongoose, photographing it in the wild and discovering its life cycle, behaviour patterns and food.

On November 6 Mr. Morley Penistan addressed us on "Forestry and Wildlife" illustrating his talk with slides. He explained the changes in wildlife and flora with the cycle changes in felling and re-afforestation.

On December 5 Mr. Peter Conder spoke on "Conservation in America," comparing and contrasting various aspects on both sides of the Atlantic

GWYNNETH STERNE, *Hon. Secretary.*

GENERAL FIELD MEETINGS

EIGHTEEN field meetings were held during the year and were generally well supported. A social evening was also held.

A list of the meetings and leaders with some indication of the main objects of interest is given below. A more complete account is kept in the records of the Field Committee.

Jan. 5: Durlston Head, Littlesea, Studland, and Sandbanks; sea-birds, ducks, and shore birds. Mr. D. A. C. Cullen.

Feb. 9: Porlock Weir. Sea-birds and waders. Mr. H. G. Hockey.

March Social Evening. Birds and Animals of India. K. Ghani.

Mar. 16: Cock Hill quarry, Doulting quarry, Kilmersdon coal mine, Berry Hill Woods. Geology. Mr. I. H. Ford.

Apr. 4: North Hill, Minehead. Birds (ravens and peregrines), and early spring flowers. Mr. H. G. Hockey.

Apr. 22: Evening Walk through Bristol Forest. Forestry. Mr. M. Scott.

May 18: Tretower (an Elizabethan mansion) and Dan-yr-Ogof caves. (Upper Swansea Valley) including the bone cave. Mr. H. G. Hockey and Mr. E. Mason.

May 21: Inglestone Common. Woodland birds, including nightingales. Mr. D. A. C. Cullen.

June 9: Jubilee Path, Tidenham Chase, Woodland plants and birds. Mr. H. G. Hockey.

June 15: Little Neath river (near Pont Nedd Fechar). Dippers and many species of fern. Mellte river (near Ystradfellte), waterfalls, Glanyr-Afon, an old farm house, now the South Brecon field centre. Mr. H. G. Hockey.

July 5: Coldwell Rocks, Symonds Yat. Striking geological formations and trees. Dr. A. F. Devonshire.

July 12: Margam Forest, near Bridgend, Glamorgan. Exhibition to celebrate the 50th anniversary of the Forestry Commission. Mr. H. G. Hockey.

July 23: Priddy Pools. Industrial archaeology and botany.

Aug. 3: Steart, Combwich, and Durley Reservoir. Autumn migration in birds, great variety seen, including 2,000 swifts. Mr. D. A. C. Cullen.

Aug. 16: Brean Down, Plants and Birds. Miss Groves.

Sept. 7: Scenery of the Mendips. Geography and geology. Mr. A. E. Frey.

Oct. 4: Avebury, Silbury Hill and neighbourhood. Archaeology. Mr. A. C. K. Fear.

Nov. 16 and Dec. 14: Woodspring Hill, A study of birds. Mr. H. G. Hockey.

A. F. DEVONSHIRE, *Hon. Field Secretary.*

Obituary

Mr. I. W. EVANS

Mr. Ivor Evans, who died on 9 November, 1969 at the age of 78 years, had been a member of the Society since 1919 and President of the Botanical Section for many years. He was an enthusiastic field botanist and had already been making records for several years; a number of his records can be found in White's Bristol Flora, published in 1912. He never had any systematic training as a botanist, but he was a friend of Miss Roper, James White, Mrs. C. I. Sandwith and her son Mr. C. I. Sandwith, and he learned much from them, particularly from Miss Roper. His natural aptitude, combined with a wonderful memory, made him an outstanding figure in botanical circles. He helped Miss Roper with the wild plant table at the Museum in prewar days, and after the war he helped Mrs. Wakefield with it. He was also an excellent after-dinner entertainer and helped greatly at the early dinners of the B.N.S. in the 1920's.

He was President of the Field Section as it was then called from 1939–45, and led numerous field meetings for the Society; by the end of 1964 he had led more than a hundred. Most of these were for the botanical section, but he also led a number of general field meetings. After 1964 ill-health prevented him from leading any more field meetings, and also forced him to resign the Presidency of the botanical section, which he had held since 1956. He still came to an occasional field meeting, the last occasion being an evening meeting in 1966 to the Humpy-Tumps, a patch of acid soil near the railway at Keynsham, which was one of his favourite localities. His herbarium which contains a substantial number of aliens, is housed in the Bristol City Museum.

He made numerous records for Bristol Botany up to 1966 when he made his last two records of aliens growing near his home in the Old Market. He had an unrivalled knowledge of the flora of the Bristol district, and any journey taken with him in a 'bus or coach was always enlivened because he would point out from time to time places where some interesting plant grew or used to grow, very often a plant that he had first discovered himself. He was always ready to share his knowledge with others, and was just as ready to point out the common plants of a country lane to beginners as to show some of the rarities to members with more knowledge. He was equally interested in discoveries made by others, and was always ready to make a special journey to see a fellow botanist's fresh discovery.

A. F. DEVONSHIRE.

I. W. EVANS

BRISTOL BOTANY IN 1969

By A. J. Willis

(Department of Botany, University of Sheffield)

ALTHOUGH, in a year of average temperature and sunshine, February and March were colder and duller than normal, the spring flowers were not much later than usual. The total rainfall for 1969 (30.28 inches) was less than average, but July was a very wet month, 3.50 inches of rain falling in a single day. On the other hand, in October there was very little rain (the total for the month was 0.47 inches) and the temperature, after a fairly warm and sunny summer, was well above average, resulting in extended flowering in the autumn. Very late flowering plants were also favoured by a sunny November.

Much to be regretted was the felling in 1969 of the well-grown tree of the very rare and endemic *Sorbus wilmottiana* E. F. Warb. on Clifton Down, **G.**, from which the type was described; this species is totally restricted in its distribution to the Avon Gorge. The tree was cut down in the course of opening the view across the river. A deputation attended upon the Corporation of Bristol on this matter and steps are being taken to protect the stump which fortunately still shows signs of life. This regrettable occurrence highlights the importance of the need for close liaison between naturalists and City and County authorities, and with the growing awareness regarding conservation and increasing activities of Naturalists' Societies and County Trusts it is hoped that in the future losses such as that described above will be precluded.

With the death of Ivor W. Evans, on 9 November 1969, a valuable link with former eminent botanists of the Bristol region, notably J. W. White, was broken. An obituary appears on page 572.

This year has seen a steady consolidation of records of some of the less common species of the Bristol flora, giving more complete knowledge of the range of these plants. Reports of the continued existence of some rarities in known localities have been made and are reassuring (e.g. *Cyperus fuscus* in the Gordano valley, *Littorella uniflora* on Mendip). Mrs. Appleyard has again been very active with respect to bryophytes, and her Bryophyte Flora of North Somerset is included in the 1970 issue of the *Transactions of the British Bryological Society*. The reports given later in the present article include three new county (Somerset) records of mosses (*Ephemerum sessile*, *Amblystegiella sprucei*, here in its most southerly British station, and

Eurhynchium pulchellum) made by Mrs. Appleyard in 1969, and also two new vice-county (v.c.6) records of mosses.

A visit to the Denny (in Monmouthshire, but noted by J. W. White (*Flora of Bristol*, 1912, p. 204) as in the County of Bristol), the limestone island in the Severn estuary, was made by Dr. J. V. Beer on 23 June 1969, and reported in the Journal of the North Gloucestershire Naturalists' Society, Vol. 20, No. 9, September 1969. The sixteen plants noted by Dr. Beer on that visit included *Lavatera arborea* L., long known from the Denny, and *Fumaria officinalis* L.

Among the nomenclatural changes in British plants listed by J. E. Dandy (*Watsonia*, December 1969, Vol. 7, Part 3, pp. 157–178) is that of the Bristol rockcress, *Arabis stricta* Huds., which should now be known as *Arabis scabra* All. The name *A. scabra* was given by Allioni to two different species at different times; the British plant, in recent years called *stricta*, is in fact based on Allioni's name of 1773, and is correctly referred to as *A. scabra*.

Names of contributors of several records are abbreviated thus:

J.A., Mrs. J. Appleyard
C.H.C., C. H. Cummins
A.F.D., Dr. A. F. Devonshire
I.F.G., Miss I. F. Gravestock
E.J.L., Miss E. J. Lenton
P.J.M.N., P. J. M. Nethercott
D.M.S., Dr. D. Munro Smith

Ophioglossum vulgatum L. In fair quantity in meadow, Wild Country Lane, Barrow Gurney, **S.**, *Dr. T. E. T. Bond.*

Aquilegia vulgaris L. A form with pale pink flowers, perhaps derived from a garden, Kingsweston Down, Bristol, **G.**, *P.J.M.N.*

Chelidonium majus L. Double-flowered plants, by field, Whitchurch Lane, Bristol, **S.**, *A.F.D.;* also at Downend, **G.**, *D.M.S.*

Cochlearia officinalis L. A mauve-flowered form, coastal path, east of Nore Point, near Portishead, **S.**, *C.H.C.*

C. danica L. Middle Hope, **S.**, *P.J.M.N.;* an extension in range from Sand Point (White, *Flora*).

Rorippa islandica (Oeder) Borbás. Wick, **G.**, *P.J.M.N.* This may be the locality noted by White (*Flora*) as "Wyck . . . Still there in 1900."

Hypericum androsaemum L. A single plant in stone wall by stream, Chew Magna, **S.**, *A.F.D.*

Stellaria holostea L. A form with laciniate petals (var. *laciniata* Bromf.) in lane near Norton Hawkfield, **S.**, *A.F.D.*

Oxalis acetosella L. With lilac petals (var. *lilacina* Lange), Oldbury Court Woods, Glen Frome, **G.**, *D.M.S.*

Rhamnus catharticus L. Small bushes, on Carboniferous limestone, Wavering Down and Crook Peak, **S.**, *P.J.M.N.*

Vicia sylvatica L. Splatt's Wood, near Kilcott, **G.**, *C.H.C.* and *A.F.D.*

Trinia glauca (L.) Dumort. Compton Hill, **S.**, *P.J.M.N.* This locality lies between Crook Peak and Wavering Down where Honewort has long been known.

Apium nodiflorum (L.) Lag. Abundant and encroaching in stream, marsh, Windsor Hill, Shepton Mallet, **S.**, *I.F.G.*

Sison amomum L. A few plants by roadside, near Chew Magna, **S.**, *A.F.D.*

Silaum silaus (L.) Schinz & Thell. Old pastures at Hanging Hill, near Upton Cheyney, **G.**, *P.J.M.N.:* and North Weston, near Portishead, **S.**, *P.J.M.N.* and *C.H.C.*

Linaria repens (L.) Mill. Old wall, Clifton, Bristol, **G.**, *D.M.S.;* also *Papaver dubium* L.

Chaenorhinum minus (L.) Lange. Old railway track, disused station, Midsomer Norton, **S.**, *I.F.G.*

Kickxia elatine (L.) Dumort. With *K. spuria* (L.) Dumort.; fallow field, south of Big Wood, Weston-in-Gordano, **S.**, *C.H.C.*

Mentha longifolia (L.) Huds. Waste ground east of Nore Point, near Portishead, **S.**, *C.H.C.*

Littorella uniflora (L.) Aschers. Several well established patches, bearing a few flowers in July, in a small pond on the southern edge of Black Down, Mendip, **S.**, *Dr. C. E. D. Smith.* The pond, which was full of water in May and again in November, but dry during the summer, is probably the one to which White (*Flora*) refers and in which *Littorella* was found in flower by him in July, 1908.

Campanula rotundifolia L. A purple form with large flowers less inflated than usual, Avon Gorge, **G.**, *E. S. Smith* (conf. *Dr. Kovanda*, per *P. F. Bird*).

Cirsium eriophorum (L.) Scop. The colony, known for many years, is extending at Kingsweston Down, Bristol, **G.**, *P.J.M.N.;* on slope, near the Zoo, Clifton, **G.**, *D.M.S.;* sloping field, north-west of Big Wood, Weston-in-Gordano, **S.**, *C.H.C.*

Cichorium intybus L. Colonizing roadbank, Belmont Hill, Failand, **S.**, *I.F.G.*

Picris hieracioides L. Shady roadside near Chew Magna, **S.**, *A.F.D.*

Lactuca serriola L. One plant by bank of Avon, **S.**, *A.F.D.;* also on tip, Kingswood, **G.**, *D.M.S.*

Epipactis palustris (L.) Crantz. Abundant flowering spikes in Max Bog, near Winscombe, **S.**, *Dr. C. E. D. Smith.* Surviving vigorously in this small peaty area from which it was recorded in 1912 (White, *Flora*) and in 1915 (Knight, *Heart of Mendip*).

Spiranthes spiralis (L.) Chevall. Burledge Hill, near Bishop Sutton, **S.**, *E.J.L.*

Ophrys apifera Huds. With *Serratula tinctoria* L., in permanent pasture, Burledge Hill, near Bishop Sutton, **S.**, *E.J.L.*

Dactylorhiza maculata (L.) Soó ssp. *ericetorum* (E. F. Linton) Hunt & Summerh. One plant in limestone heath above Goblin Combe, near Cleeve, **S.**, *A.F.D.*, close to plants of *D. fuchsii* (Druce) Soó.

Scirpus sylvaticus L. Swampy ground by the Frome, Oldbury Court Woods, Glen Frome, **G.**, *D.M.S.;* also on marshy ground by a tributary of the Little Avon, near Stone, **G.**, *E.J.L.* and *A.F.D.*

Cyperus fuscus L. 1969 was a good year for this sedge; several dozen small plants were present on earth thrown from a ditch and on wet mud, Walton-in-Gordano, **S.**, *P.J.M.N.*

Carex disticha Huds. Swampy ground, Shortwood, **G.**, *D.M.S.*

×*Festulolium loliaceum* (Huds.) P. Fourn. Several plants of this hybrid by the roadside, Dundry, **S.**, *A.F.D.*

Calamagrostis epigejos (L.) Roth. Border of wood, North Weston, near Portishead, **S.**, *P.J.M.N.* and *C.H.C.*

Phalaris arundinacea L. var. *picta* L. Established on roadside, Big Wood, Weston-in-Gordano, **S.**, *C.H.C.*

ALIENS. Papaver somniferum L. Plentiful, some flowers dark crimson, waste ground, Downend, **G.**, *D.M.S.*

Eschscholzia californica Cham. Waste ground, Downend, **G.**, *D.M.S.*

Rapistrum orientale (L.) Crantz. Tip, Kingswood, **G.**, leg. *D.M.S.*, det. *Dr. P. W. Ball.*

Atriplex hortensis L. var. *rubra* (Crantz) Roth. This garden escape was established on tip, Kingswood, **G.**, leg. *D.M.S.*, det. at British Museum.

Linum usitatissimum L. A white form, present since 1966 on tip, Kingswood, **G.**, leg. *D.M.S.*, det. *A. J. Willis;* also present was *Camelina microcarpa* Andrz. ex DC.

Oxalis incarnata L. In gardens, where no recent plantings and spreading as a weed, Clifton, Bristol, **G.**, leg. *D.M.S.*, det. *Dr. D. P. Young* (cf. Young, *Watsonia*, 1958, Vol. 4, pp. 51–69, where *O. incarnata* noted as often running wild and as a relic of cultivation).

Melilotus alba Medic. Single plant on site of demolished buildings, central Bristol, near Temple Meads, **S.**, *A.F.D.*

Prunus domestica L. ssp. *domestica.* Surviving on the sea cliff, Portishead, **S.**, *C.H.C.* (conf. *A. J. Willis*), where long since known (White, *Flora*).

Oenothera erythrosepala Borbás. With *Althaea rosea* (L.) Cav. and *Lobularia maritima* (L.) Desv., waste ground, Nore Point, near Portishead, **S.**, *C.H.C.;* other garden escapes at Redcliffe Bay, **S.**, include *Lathyrus latifolius* L., *Linaria purpurea* (L.) Mill., and *Chrysanthemum maximum* Ramond, *C.H.C.*

Teucrium chamaedrys L. Established at Sand Point, **S.**, *I.F.G.*

Leycesteria formosa Wall. Naturalized in the Forestry Commission part of Leigh Woods, Bristol, **S.**, *P.J.M.N.*

Inula helenium L. Established in permanent pasture, near Burledge Hill, Bishop Sutton, **S.**, *E.J.L.*

BRYOPHYTES. Atrichum undulatum (Hedw.) P. Beauv. var. *minus* (Hedw.) Paris. Among stones in quarry, Winford, **S.**, *J.A.* This variety is new to v.c.6.

Ditrichum heteromallum (Hedw.) Britt. On Old Red Sandstone, edge of grassy track between tow-path and wooded area, Leigh Woods, **S.**, *J.A.* Other v.c.6 records are Rowberrow and Clevedon.

Dicranella staphylina Whitehouse. This is a newly described species, the distribution of which is not yet fully known but it is apparently widespread in the British Isles. Field near Portbury, **S.**, *J.A.* The first v.c.6 record is from Kilmington, outside the area covered by this report; Mrs. Appleyard has also found it near Wincanton.

Gymnostomum aeruginosum Sm. In 1955, in Cheddar Gorge, **S.**, *T. Laflin.* This is the third locality for v.c.6.

Weissia microstoma (Hedw.) C. Müll. var. *brachycarpa* (Nees & Hornsch.) C. Müll. Field near Chantry and Tor Hill, Wells, **S.**, *J.A.;* second and third records for v.c.6.

Rhacomitrium heterostichum (Hedw.) Brid. On gritstone wall, Pensford, **S.**, *J.A.;* third v.c.6 record.

Ephemerum sessile (Bruch) Rabenh. In small quantity, at edge of field near Nettlebridge, **S.**, *J.A.* This moss is new to Somerset.

Bryum violaceum Crundw. & Nyh. Very sparingly on tow-path, Avon Gorge, **S.**, *J.A.* The first record for v.c.6. A description of this species of the *Bryum erythrocarpum* complex, with relatively small gemmae and with rhizoids usually deep violet, is given by

A. C. Crundwell and E. Nyholm in *Trans. Br. bryol. Soc.*, 1964, Vol. 4, Part 4, pp. 597–637.

Zygodon viridissimus (Dicks.) R. Br. var. *stirtonii* (Schimp. ex Stirt.) Hagen. Rocks at western end of Brean Down, **S.**, *J.A.* Second v.c.6 record.

Orthotrichum stramineum Hornsch. ex Brid. On ash at Tor Hill, Wells, **S.**, *J.A.* A second record for Somerset.

Antitrichia curtipendula (Hedw.) Brid. On ash trunk by stream in small wood near Holcombe, **S.**, *J.A.* The only other Somerset records were made by Rev. C. H. Binstead, from Ebbor Gorge, 1887, and near Wells, 1920.

Campylium calcareum Crundw. & Nyh. On limestone wall, Murder Combe, near Frome, and limestone boulder in quarry, Avon Gorge, **S.**, *J.A.;* the second and third Somerset records.

Amblystegiella sprucei (Bruch) Loeske. On limestone rock ledge, Chilcote Wood, near Wells, **S.**, *J.A.* This new county record represents the most southerly British station for this moss; the nearest records are from West Gloucester.

Isothecium striatulum (Spruce) Kindb. On rocks, The Gully, Avon Gorge, **G.**; and also *Funaria muhlenbergii* Turn. on scree slope in this locality, *D.M.S.*, conf. *J.A.*

Eurhynchium pulchellum (Hedw.) Jenn. Harptree Combe and Chilcote Wood, near Wells, **S.**, *J.A.* This puzzling moss, new to Somerset, is widespread in Harptree Combe, but only a small quantity was found in Chilcote Wood. Mr. A. C. Crundwell and Mrs. E. Nyholm name it, rather tentatively, *Eurhynchium pulchellum*, although it differs in several ways from the type and known varieties of that species. Details of these differences are included in Mrs. Appleyard's Bryophyte Flora of North Somerset (*Trans. Br. bryol. Soc., 1970*).

Riccia cavernosa Hoffm. This is the species formerly known as *R. crystallina* L. On exposed mud, Litton reservoir, **S.**, *J.A.* The only other Somerset record is from margin of dune pool, Berrow, where it now appears to be extinct.

Scapania compacta (Roth) Dum. A curious form of this plant, named by Mrs. J. A. Paton, was found on a boulder at the head of Harptree Combe, **S.**, *J.A.*

I am indebted to Mrs. J. Appleyard and Mr. P. J. M. Nethercott for help in assembling these records and also to Miss C. H. Slowley of Long Ashton Research Station for the supply of meteorological data.

BRISTOL BIRD REPORT 1969

Compiled by the Editorial Committee of the
B.N.S. Ornithological Section

P. J. Chadwick
G. E. Clothier
H. H. Davis
G. A. Forrest
H. R. Hammacott
G. Sweet
S. M. Taylor

THE mild weather of late 1968 continued throughout January, producing reports of early nesting. Blackcaps, Chiffchaffs and at least one Black Redstart over-wintered. A Richard's Pipit was a reminder of Oct. 1968's influx. Very large Dunlin flocks were seen, especially at the Yeo and Axe Estuaries, and at the New Grounds the peak count of White-fronted Geese, on the 29th, was only a hundred short of the 1968 record figure. February brought an abrupt change to cold weather, with some snowfalls, and many geese left early so that the month's maximum fell, unusually, below January's. Snow on the 19th—20th was followed by impressive Lapwing movements but these, like others earlier in the year, were to the N.E. rather than to the S.W. March was the coldest for some years, and there were reports of failed nests and of Blue Tit broods dead in nest boxes. However, a Blackbird was feeding fledged young on Horfield Common on the 23rd (HGH). Some Chiffchaffs arrived early in the month, but the cold halted migration and the only hirundines seen were a few Sand Martins.

April was dry and sunny, but with squally showers at times; migratory movement got under way again, though it was mid-month before substantial numbers of Sand Martins appeared at the reservoirs, and another week before Swallows and House Martins were plentiful. Two Rooks' nests were built in Colston Avenue, Bristol, but like the one in 1968 they were apparently abandoned. Avocets were seen at Sand Bay, and Slavonian and Black-necked Grebes at Chew. A Spoonbill there was one of two present in S. England. The month produced only three or four Whitethroat records, foreshadowing an unprecedented general dearth. In some places locally the species was outnumbered by Lesser Whitethroats, and it was July 6 before the first one was ringed at Chew (C). In May more Avocets were seen near Clevedon and at the New

Grounds—the largest number to date. There were two reports of Hoopoes, near Bath on the 11th and at Stonehouse on the 26th, based respectively on several calls heard, and on a fleeting glimpse. Both observers know the species, but in neither case are alternatives ruled out completely, and it seems safest to class them as 'possibles' only. The month was rainy. June opened cool, turned fine and dry, and ended changeable. July was dry and sunny with some thunderstorms, and heavy rain on the 28th–29th caused some flooding. Winds were from a westerly point in the second half, and a Great Skua, a Fulmar and Manx Shearwaters were seen off Sand Point. Several Little Ringed Plovers were reported, as were others in September. It was only in 1954 that this species, now seen annually, was first recorded in the area.

August had short warm spells with thundery showers. It was notable for some large wader flocks. Curlew and Redshank were plentiful, and Ringed Plovers totalled some 3,000, with several hundred more just to the S. of the area, at Brean, and up to 1,000 at Steart. A few Curlew Sandpipers were present from the 17th, then forty appeared at the New Grounds, on the 25th, with a rapid rise to 100 and an equally rapid decline in early September. A second peak of *c.*45 occurred on September 9, and smaller numbers were seen along the Somerset coast. Two or three, trapped at Chew, were judged from their low weights to be new arrivals (C). (Previous post-war peak counts were twelve in 1946, fifteen in 1956 and forty in 1963). The birds were part of an influx of several thousands drifted W. off their migration route from N. Europe to their African winter quarters.

September was dull though dry at first, but was wet from the 10th—18th. Some late Swifts were reported, the last three between the 15th—18th. A White-winged Black Tern on the 7th was our seventh record, and the fifth since 1966, while an immature Red-necked Grebe was the eighth since 1950. In the second and fourth weeks, W. storms took Manx Shearwaters and Gannets to the Estuary, and a Great Skua to Chew. Transatlantic storm-driven vagrants included Pectoral Sandpipers, of which two came to the N. Som. reservoirs. There were more Little Stints locally than usual in September; this happened too in the other Curlew Sandpiper peak years mentioned above, and illustrates the association between movements of the two species. As in 1968, October was very mild, with little rain, and some Swallows remained late—a pair were at the nest up to the 11th, and one was seen at Frampton on Severn on Nov. 3. Exceptional flocks of Black-tailed Godwits were seen during the month.

November was cold; the second week was very wet, with W.

winds reaching gale force at times. A Gannet, another Red-necked Grebe and a Black-throated Diver (the eighth record for the area) were reported. December too was cold and dull, with sleet and snow in the latter half, when a ♀ Kestrel came to a bird table at Cromhall (JH). A Red-throated and two Great Northern Divers visited Cheddar res.; one of the latter, a small bird, was also reported as a Black-throated, but careful study of photographs supported its identification as a Great Northern. An Avocet also visited Cheddar res. on the 18th. Further large Dunlin flocks were reported, and the year's only large count of Knot came from the Axe Estuary on the 26th.

Common Birds. Grasshopper Warblers are reported increasingly frequently. Subjective impressions are of a good Song Thrush breeding season. One experienced observer remarks, "Starling juvs. in 1969 summer flocks numbered in dozens rather than hundreds," and mentioned an apparent shortage of Mallard and Mute Swan broods. Chaffinches, though still numerous, are decidedly less so than ten or more years ago, and figure less often on Nest Record Cards. A single record of Green Woodpecker from **G.**, against fifty from **S.**, and two of Tree Pipit, against fourteen, surely reflect observer bias, rather than numbers!

Yellow Wagtails *Motacilla flava.* Several Blue-headed Wagtails *M.f. flava* have been seen in recent years, principally at Chew, where another was ringed on Aug. 28, 1969 (C). Aberrant types also seem to be more common, both in **G.** and in **S.**, with pale blue, grey or yellow heads and other plumage variations. The blue- and grey-headed forms are probably hybrids between *flava* and our native *flavissima* (see Milne, B.S., *Brit. Birds* **52**, 281 – 295). The others may be mutant *flavissima;* Milne cites a 'yellow-head' with normal *flavissima* parents. On May 28 an adult ♂ of the northern Grey-headed race *M.f. thunbergi* was seen at the New Grounds (LPA), and at about that date a dead bird was found at Avonmouth on a cargo ship from the Baltic (HAT). The corpse was in poor condition when received, but most closely resembled *thunbergi* (with dark grey head and nape, no eyestripe, dark grey-green mantle, bright yellow underparts, no white on chin) (SMT). The coincidence of the dates is interesting, but it is not known where the dead bird joined the ship.

Rarities. Besides those already listed, the year saw a Red-breasted Goose (the seventh) at the New Grounds, and an Aquatic Warbler (the fifth) and four Serins in Somerset. The latter species was previously recorded in the County at Taunton in 1866 and at Brean Down in 1965.

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Headings **G.** and **S.** refer to South Glos. and North Somerset, respectively. The boundaries are defined below on page 600. Prior to Jan. 1, 1968, the area was slightly smaller and was as defined in *Proc. B.N.S.*, 1960, p. 114.

BLACK-THROATED DIVER *Gavia arctica* *See page* 581.

S. One, Cheddar res., Nov. 26–29 (BK, DJP, BR).

GREAT NORTHERN DIVER *Gavia immer* *See page* 581.

S. Two, Cheddar res., Jan., and one to Feb. 12; one, Dec. 21–24 and two on 27th and 28th (RJL, JAMCG, BR *et al.*).

RED-THROATED DIVER *Gavia stellata*

G. One on Estuary, New Grounds, May 19 (LPA).

S. One, Cheddar res., Dec. 21–31 (RMC, RJL, KEV *et al.*).

GREAT CRESTED GREBE *Podiceps cristatus*

G. and **S.** Breeding records from Frampton Pools (6 pairs), Tortworth (1 pr., 2 broods), Emborough Pond, Orchardleigh Lake (2 nests) and Blagdon and Chew Valley resrs. Large numbers at latter in autumn, with 330 counted, Oct. 4 and 16th.

RED-NECKED GREBE *Podiceps griseigena See pages* 580, 581.

G. One on Estuary, New Grounds, Nov. 15 (TDE).

S. Immature, Cheddar res., Sept. 25–Oct. 2 (TRC, SJM, BR *et al.*).

SLAVONIAN GREBE *Podiceps auritus*

S. One, Chew Valley res., Apr. 11 (PC); two, Cheddar res., Nov. 28–Dec. 14 (HRHL, MS *et al.*) and three together on 17th (RJL).

BLACK-NECKED GREBE *Podiceps nigricollis*

S. Single birds, Chew Valley res., Apr. 10–16 (AJP, KEV) and Blagdon res., Nov. 22 (RMC).

MANX SHEARWATER *Procellaria puffinus*

G. One found in dutch barn, Stroud, Sept. 30—flew off when released on Estuary, Frampton-on-Severn (RKB).

S. Party of 30 flying off Sand Point, July 20 (RA); eleven, same place, Sept. 21 and five, Oct. 1 (TB).

FULMAR *Fulmarius glacialis*

G. One, Aust, Sept. 27 (PB, RMC, BK).

S. Single birds, Steep Holm, May 3, Aug. 31; Brean Down, May 25; and off Sand Point, June 13, July 29. Two, Weston Bay, Aug. 11 (RA, TB, AJP *et al.*).

GANNET *Sula bassana*

S. Imm. off Brean Down, Sept. 11 (BR). Single birds, Sand Point, Aug. 27, Sept. 29, Nov. 9 (TB) and Steep Holm, Sept. 21 (S).

CORMORANT *Phalacrocorax carbo*

G. and **S.** Thirty-nine pairs, Steep Holm. Reported from coast as far N. as New Grounds, and from all reservoirs, with up to 16, Chew Valley in March and December, and 12, Cheddar, December.

HERON *Ardea cinerea*

S. Population fully recovered from effects of 1962-3 winter and at its highest (70 nests) during the last 20 years. Two off Steep Holm, Aug. 30, 31st.

BITTERN *Botaurus stellaris*

S. Two, possibly three, Chew Valley res., Feb. 16–28 (PJC, JBOR *et al.*) and one, Dec. 20 (RA).

SPOONBILL *Platalea leucorodia See page* 579.

S. One, Chew Valley res., Apr. 13–21 (HJC, AJP).

GARGANEY *Anas querquedula*

G. Pair, Frampton-on-Severn, Apr. 4–Sept. 2 (LPA, TDE, JDS).

S. Again bred, Chew Valley res., where up to 7 ♂♂ noted in May; max. of 17 birds, Sept. 8 (PLG, JBOR, AW *et al.*). Two, Cheddar res., April 18 (MGW). Pair, Blagdon res., Apr. 20; three, Sept. 21 and two on 28th (PJC, PGF).

GADWALL *Anas strepera*

G. and **S.** Bred successfully, Frampton Pools (only the second definite record, first being in 1956) and Chew Valley res., where up to 115, July and August; dispersed by mid-Dec., first—as in 1968—to Cheddar. A few seem to over-winter on small waters, e.g. Berkley nr. Frome and Orchardleigh.

PINTAIL *Anas acuta*

G. and **S.** No large winter counts from reservoirs, but 540, New Grounds, Feb. 19 and up to 50, Frampton Pools, around this date. Reservoirs: up to 20, Chew Valley, Sept.–Dec.; Cheddar total reached 47 in Nov. and 44 in Dec.; 14, Blagdon, Dec. 28.

SHOVELER *Spatula clypeata*

G. and **S.** New Grounds: 380, Feb. 19; 85, Oct. 31; 200, Dec. 1. Frampton Pools: 70, Feb. 9; 60, Mar. 16; 50, Apr. 5; 110, Sept. 21; 100, Oct. 5, then rapid decrease. Max. reservoir counts: 80, Blagdon, Jan. 12, and 82, Sept. 28; 150, Chew Valley, Jan. 15 and 180, Nov. 5, increasing to 290, Dec. 23.

RED-CRESTED POCHARD *Netta rufina*

G. Up to ten seen regularly, Frampton Pools (TDE, PES *et al.*) —probably escapes from Wildfowl Trust.

SCAUP *Aythya marila*

G. Frampton Pools: ♂, Jan. 5 (TDE); imm. ♂♀, Dec. 24 (JBOR). Also two on canal, Splatt Bridge, Dec. 24 (JBOR) and one on 30th (LPA).

S. Single ♂♂, Cheddar and Chew Valley resrs., Jan.–May 8 (ACL, KEV *et al.*). Autumn records: single ♂♂, Blagdon res., Sept. 7, Dec. 28; Cheddar res., Sept. 24–Oct. 22, then up to seven (1 ♂) in Nov. and five (1 ♂), Dec. (PC, RMC, SJM *et al.*).

TUFTED DUCK *Aythya fuligula*

G. Up to 300, Frampton Pools, Jan., increasing to max., 394, on Feb. 16th, 200 in March and 100–150, early April. At least eight broods there, July–Aug.; 150–200 present, Nov.–Dec., with max. of 235, Nov. 29.

S. Up to 525 at reservoirs, early to mid-April. Bred successfully, Chew Valley res. and Orchardleigh Lake. Pairs, Emborough, Apr. 27 and railway ponds, Nailsea, May 26.

POCHARD *Aythya ferina*

G. Frampton Pools: 180–225, January to early March, but 300, Feb. 22; up to 130, October to December.

S. Fewer counts available, largest being 790 at Chew Valley res., Oct. 5 and 1,080 at Blagdon res. on Dec. 28, when 125 also present at Chew Valley. At least three broods, Chew Valley.

FERRUGINOUS DUCK *Aythya nyroca*

S. Adult reported in Dec. 1968 seen at Chew Valley res. and Orchardleigh; last reported on Feb. 13 (RMC, BR, RBHS *et al.*).

GOLDENEYE *Bucephala clangula*

G. Up to five, Frampton Pools, Jan. to Apr. 12 and three, Nov.–Dec.

S. About 45 present on resrs., mid-Jan., possibly fewer in Feb., building up to *c.*60, Mar. 24; 25 still present, Apr. 20; last record—♀, Orchardleigh, May 7. First, autumn—one, Chew Valley res., Nov. 8; 30 there by end Dec. (GBB, RNC, TL *et al.*).

LONG-TAILED DUCK *Clangula hyemalis*

G. One, Frampton Pools, Nov. 22, 23 (RKB, TDE).

S. Single birds, Chew Valley res., May 7–June 1 (WGB, RH, CR *et al.*), and Cheddar res., Dec. 27, 28 (BR).

COMMON SCOTER *Melanitta nigra*

G. Adult male, Frampton Pools, Mar. 23 (TDE).

S. Male off Clevedon, Mar. 20 (AJT). Sand Bay: one, Jan. 22; two, Feb. 27; four, June 15; one, Aug. 31; and one or two, September to December (RA, TB, PC, DJP).

EIDER *Somateria mollissima*

G. Female, New Grounds, Apr. 28 (LPA).

S. Immature bird off Sand Point, Mar. 25 (PC).

RED-BREASTED MERGANSER *Mergus serrator*

G. One on Estuary, New Grounds, Nov. 12 (LPA).

S. Six, Chew Valley res., Jan. 14 (WGB). Two off Sand Point, Dec. 2 (TB, DJP) and one, Blagdon res., Dec. 20 (RA).

GOOSANDER *Mergus merganser*

G. One, Frampton Pools, Feb. 23, Mar. 3 and Nov. 29 (TDE).

S. Up to 19, Chew Valley res., Jan., but only six in Feb. and four, Mar. 4 (RMC, DCJ, BR *et al.*). Male, Blagdon, Mar. 2 (PJC). Autumn reservoir records: seven, Chew Valley, Nov. 11 increasing to 16, Dec. 30 (PLG, HRHL *et al.*); two, Cheddar, Dec. 7; and seven, Blagdon, Dec. 23 and 28 (PJC, DJP).

SMEW *Mergus albellus*

S. Brownhead, Chew Valley res., Nov. 22 (RA) and two in Dec. (RMC, PLG *et al.*). One, Cheddar res., Dec. 7 (PJC, MAW).

NORTH AMERICAN RUDDY DUCK *Oxyura jamaicensis*

G. Frampton Pools: up to nine, Jan., and eight, Feb.; adult ♀ with brood (4), July 27; eight, Oct. 12th and 14, Nov. 22.

S. Nine, Blagdon res., and 17, Chew Valley, Jan. 12; up to 37, Chew Valley, in Feb., but few in breeding season; numbers built up to 35, end year. No breeding records.

Shelduck *Tadorna tadorna*

G. and **S.** Breeding season survey showed *c.* 350 ads., New Grounds to R. Avon, June 13 and *c.* 64 pulli, June 28; and *c.* 200 ads., R. Avon to Birnbeck I., June 13, and *c.* 163 pulli, June 28. More broods arrived at coast later. Pair bred, Chew Valley res., five hatched.

Greylag Goose *Anser anser*

S. Two large-sized grey geese in flight, Sand Point, Feb. 9 and a single bird, also in flight, Apr. 27, were identified as Greylags (RA). Records of genuinely feral Greylags in N. Somerset are very few, and it must again be stressed that many are kept full-winged in the Wildfowl Trust enclosures (Eds.).

White-fronted Goose *Anser albifrons* *See page* 579.

G. New Grounds: rapid increase from 3,900 at end of 1968 to 6,600, Jan. 29. Well over 4,000 present throughout Feb., then sharp decline to 1,100, Mar. 7 and 600 on 8th; 15 (last seen), Mar. 24. First autumn arrivals: seven, Oct. 20; 1,400 by early Dec. and 3,650 by end of year; 30–35% young birds—evidence of good breeding season (WT). Elsewhere, 50 in flight, Coalpit Heath, Jan. 5, two parties (50 and 22) overhead, Charfield, on 11th, and 52 over Chittening Warth, Dec. 28.

S. Twenty-three, Sand Bay, Jan. 2nd and 14, Feb. 18; 14 over Nailsea Moor, Jan. 2; 31, Woodspring Bay on 4th and 80, Dec. 30; 30, Nailsea, Dec. 11; 24, Weston-s-Mare on 18th; 26, Chew Valley res., Jan. 10 and 25, Dec. 28; 62, Cheddar res., Dec. 18.

Lesser White-fronted Goose *Anser erythropus*

G. Two ads. among *albifrons*, New Grounds, Jan. 24; still there, Feb. 28, also another ad. paired with *albifrons* (MAO, PS).

Bean Goose *Anser fabalis*

G. New Grounds: an adult of the Russian race, *A. f. rossicus*, first noted on Dec. 15, 1968, was last seen on Jan. 29 (WT).

Pink-footed Goose *Anser brachyrhynchus*

G. Two, New Grounds, Jan. 23 to Mar. 24, and four, Dec. 19 to end of year (WT).

Dark-breasted Brent Goose *Branta b. bernicla*

G. Juvenile, New Grounds, Dec. 14–31 (WT).

S. Four, Sand Bay, Jan. 2 (TB) and one, Dec. 18-30 (PC, DJP). Two, on water and flying, Cheddar res., Dec. 17 (BR, JBOR).

Barnacle Goose *Branta leucopsis*

G. Five, with Whitefronts, New Grounds, throughout Jan.; two during Feb., and one Mar. 5 (WT).

CANADA GOOSE *Branta canadensis*

G. Frampton Pools stock: counts of 106, Jan. 19 and of 90, Feb. 9 (TDE, JDS). At least 12 pairs bred.

RED-BREASTED GOOSE *Branta ruficollis*

G. One, always seen with Whitefronts, New Grounds, Jan. 19–31 (WT). Seventh New Grounds record.

WHOOPER SWAN *Cygnus cygnus*

G. New Grounds: fourteen—13 ads., 1 cygnet—visited Rushy Pen Jan.–Apr. 1, but max. of 7 at any one time; one ad., Dec. 22 (WT).

S. Two, Chew Valley res., Dec. 9 (BR).

BEWICK'S SWAN *Cygnus columbianus*

G. New Grounds: up to 350, Rushy Pen, Jan.–Mar. 5; 228, Mar. 7; 154 on 22nd, 59 on 24th, 18 on 29th; last one, April 12; 439 different birds involved. Autumn records from Nov. 6; 250 by end month and 325, late Dec., with 396 individuals identified (WT).

S. Heard in fog, Blagdon res., Jan. 11 (RA); 60–70 seen over Cheddar res., same day (TL); one, Chew Valley, Jan. 27 (DW). Autumn reservoir records: two, Cheddar, Oct. 31–Nov. 21; five, Nov. 28 and six on 29th; 14, Dec. 1; one on 7th but seven next day (JAMCG, BR, MS *et al.*); 21–24, Blagdon, Dec. 6 (RA); five on 20th, ten on 25th and twelve on 28th (PJC, DJP).

BUZZARD *Buteo buteo*

G. Reported in breeding season from Elberton, Cromhall, Tortworth and Dursley. Autumn and winter records from Frampton on Severn area and Wotton-u-Edge.

S. Breeding season records from Mendip localities, Chew and Blagdon resrs., Mells, Orchardleigh, Compton Dando and near Bath. Single young reared at two sites (AEB, HWN, DW *et al.*). Outside breeding season: one or two, Weston Woods, Sand Point, Backwell, Goblin Combe, Portbury, Failand and Abbots Leigh, where one juv. present, Oct.–Nov. (MSC). Single birds, perhaps same one, Brislington and Stockwood, Bristol, Apr. 9 (PGF, KEV).

SPARROWHAWK *Accipiter nisus*

G. Two pairs bred nr. Almondsbury (AEB); two juvs. and ad., Michaelwood, early Aug. (EMA, WMC) and breeding probably near Frampton (TDE, JDS). Other Apr.–July records from Leonard Stanley, Mangotsfield area and in Bristol: Clifton, Sea Mills and Shirehampton.

S. Three pairs bred, Blagdon (AEB, PJC); one, Wrington (CG); one, Brockley (GEC, PJC) and one, probably two, nr. Long Ashton (GS). Probable breeding, Weston Woods. Records from many localities, including Bristol and outskirts, Apr.–July. Four, Goblin Combe, Nov. 2 (RNC).

GOSHAWK *Accipiter gentilis*

G. One, Frampton on Severn, Sept. 27 (PB, RMC, BK). BK, in a full account stressing large size, refers to shape, colour and mode of flight while RMC mentions large size compared with Kestrel and Sparrowhawk seen very shortly afterwards.

MARSH HARRIER *Circus aeruginosus*

G. One, New Grounds, Aug. 21 (LPA); a ♀ found injured near Nailsworth, Sept./early Oct. was taken to Falconry Centre, Newent, where it has since partially recovered (AMJ).

HEN HARRIER *Circus cyaneus*

S. Female, Sand Bay, Dec. 19 (TB, RLJ, DJP).

OSPREY *Pandion haliaetus*

S. One, Axe Estuary, Sept. 1 (RA). One found trapped in wires over stream, Blagdon res. and released by Bristol Waterworks employee, Sept. 27 (*per* PJC).

HOBBY *Falco subbuteo*

G. New Grounds: single birds, May 2, Aug. 18, 21, Sept. 1, 15th and pair, Sept. 2 (LPA, MAO). Pair, near Patchway, Aug. 3 (GS).

S. Pair reared one young; present in four other localities during summer (three ads. seen at one site, early May). Single birds: nr. Barrow res., Apr. 17 (GS); Shipham, May 17 (TBS); nr. Frome, May 26 (BR); East Horrington, May 26 (AW); Weston Woods, June 23 (RA); Blagdon res., Aug. 4 and 9th, Sept. 20 (PJC), Sept. 17 (DW) and Chilcompton area, Sept. 4 and 21st, Oct. 12 (RSH). Many records, Chew Valley res., May 18–Sept. 21 (TRC, PLG, DW *et al.*).

PEREGRINE *Falco peregrinus*

G. New Grounds: ♀, Jan.—mid Mar. and Sept. 18—end year (LPA, BAO, JDS *et al.*)

S. One imm., St. George's Wharf, Jan. 19–Mar. 22 and Nov. 29 –Dec. 14 (AEB, WGB, JFR *et al.*). One, Whitchurch, late Jan.–early Feb. (HGH). Imm. ♀, Sand Point, Aug. 24 (RA); ad. ♀, Steep Holm, Sept. 1 (S); imm., Chew Valley res., Nov. 9 (JBOR).

MERLIN *Falco columbarius*

G. Single birds: Wick, nr. Bristol, Jan. 5 (DRH); Aust, Mar. 8 (JFR) and Oldbury Court, Bristol, Dec. 14 (PLG).

S. Single birds, Clevedon, Jan. 2 (PLG); Sand Bay, Jan. 2, Feb. 16 and Oct. 1, Nov. 1 (RA, TB); Hinton Charterhouse, Feb. 28 (BR); St. George's Wharf, Oct. 4 (TBS); Chew Valley res., Oct. 26 (RMC) and Brean Down, Nov. 11 (MS).

RED-FOOTED FALCON *Falco vespertinus*

S. Male, Brean Down, June 8 (GWE). Record, accepted by *Brit. Birds* Rarities Committee, is second for County.

Details include: no trace of white about head, plumage uniformly dark except lighter under-tail coverts tinged with rust. Flight similar to that of Hobby but wings shorter and tail slimmer; wings longer and tail shorter and slimmer than those of Kestrel.

KESTREL *Falco tinnunculus See page* 581.

Records of pairs in breeding season from **G.**—Cromhall, *Oakford nr. St. Catherine, *nr. Upton Cheyney, Chittening and Clifton, Bristol; and **S.**—*Loxton, *Compton Bishop, *Cheddar, Priddy, Hinton Blewett, *Chew Valley res., *Chelvey, *Nailsea Moor, Portishead, *Failand, *Abbots Leigh, *Whitchurch and Monkton Combe. Breeding proved at localities preceded by*.

RED-LEGGED PARTRIDGE *Alectoris rufa*

S. Pair, Crook Peak, Mar. 19; one, Brean Down, Apr. 4. Breeding reported, Sand Bay, where five seen, Oct. 16 (RA).

PARTRIDGE *Perdix perdix*

G. Pair, Tockington, Mar. 30 (AEB). Bred, West Littleton, and one, Iron Acton, July 9 (BJG).

S. Covey of eight, Nailsea Moor, early March (HRH). Five Abbots Leigh, Sept. 1 and eleven, St George's Wharf on 29th (TBS). Six, Stanton Prior, Dec. 29 (MS). Breeding season reports from nine other localities.

QUAIL *Coturnix coturnix*

G. and **S.** One–two heard, Tormarton, Marshfield, Charmy Down and Toghill, June 26–28 (NJC).

WATER RAIL *Rallus aquaticus*

G. Four, Frampton Pools, Jan. 28; up to five, New Grounds, Feb., two, Apr. 14 and one, Sept. 16 (LPA).

S. Up to ten, Chew Valley res., Jan.–Mar., and single birds there, Sept.–Nov. (RA, DW *et al.*). One, Sand Bay, Mar. 23 and late Oct.–Nov. (RA). One, Blagdon res., Sept. 20 (PGF). One, Locking Pond, Dec. 23 (PC).

SPOTTED CRAKE *Porzana porzana*

S. One, Chew Valley res., Sept. 5 (RSH).

OYSTERCATCHER *Haematopus ostralegus*

G. and **S.** Noted, Jan.–Apr. 19 and Aug. 3–Dec.; up to 100, Sand Bay–Axe Estuary, up to ten elsewhere, coast and resrs.

LAPWING *Vanellus vanellus*

Bred, or breeding behaviour, Walton and Kenn Moors, Yeo Estuary and St. George's Wharf (**S.**) and Almondsbury. (**G.**). 3,500, Axe Estuary, Dec. 24 (RA). Large movements to N., Jan. 2, Feb. 7–11 and 22nd–23rd, and to S., Nov. 29 and Dec. 1.

RINGED PLOVER *Charadrius hiaticula. See page* 580.

G. and **S.** Noted all months. Very large numbers, Aug.—up to 500, New Grounds (LPA, TDE, JDS), 1,500, Chittening (NTL, RGT) and 600, Sand Bay (RA, DJP). Up to 23, Chew Valley res, Aug.–September.

LITTLE RINGED PLOVER *Charadrius dubius. See page* 580.

G. Single birds, New Grounds, May 3 and July 10–24 (LPA, TDE).

S. Two ads., Cheddar res., July 8–9 (JBOR), one imm., 12th and two, Aug. 24 (TRC, SJM). Two imms., Chew Valley res., Sept. 7–14 and one, 17th (PLG, DCJ *et al.*).

GREY PLOVER *Charadrius squatarola*

More numerous than recently. Spring records up to four, New Grounds, Jan. to June 3, with 11, Apr. 26; two, Chittening, May 4; only **S.** record in period was one, St. George's Wharf, May 15. Autumn: 40 records (8 in **G.**) of up to five, Aug. 14 to end year, from coast, moors and resrs., but up to 20, Sand Bay, Aug. 15–Sept., a period when seldom reported in the area.

GOLDEN PLOVER *Charadrius apricarius*

G. Up to 75, New Grounds, Jan.–Mar. 22 and July 24–Dec.; 64 on stubble, Mangotsfield, Feb. 17.

S. Fewer than low 1967 numbers; 18 records, Feb.–Apr. 7 and Sept. 12–Dec. Largest counts: Axe Estuary–150, Feb. 2 (RA) and 300, Apr. 7 (KDS), up to 60 in mid-Sept. and 600, Nov. 2 (RA); 12, Chew Valley res., Oct. 26; 14, Kenn Moor, Nov. 30.

TURNSTONE *Arenaria interpres*

G. and **S.** Chittening–Severn Beach: up to 200, Jan.–May 30 and July 18–Dec., with up to 500, August. Elsewhere, present on coast all months, with max., 30, Kenn Est., June 15. Single birds, Chew Valley res., April and up to three, August.

COMMON SNIPE *Gallinago gallinago*

G. and **S.** 100 reports. More numerous than recently; noted, Jan.–Apr. 20 and July 12–Dec., with up to 70, New Grounds, Mar., and up to 120. Chew Valley res., Oct.–November.

JACK SNIPE *Lymnocryptes minimus*

G. Up to three, New Grounds, Jan.–Mar. and Aug. 25–Sept. 21 (LPA, TDE).

S. Nine records of single birds, Chew Valley res. (two, Jan. 25) –(RA) and coastal localities, Jan.–Mar. 2 and Sept. 23–Nov. 30. Three flushed, Mendip, Jan. 28 and Oct. 25 (JAMCG).

WOODCOCK *Scolopax rusticola*

G. and **S.** Single birds, Weston Woods, Jan.–Mar. and Oct.–Nov. (TB); Filton, Oct. 7 (RA); Goblin Combe, Nov. 2 (F); Orchardleigh Lake, Nov. 30 (RMC) and Leigh Woods, Dec. 10 (MSC).

CURLEW *Numenius arquata*

G. and **S.** Pattern similar to 1967's. Peak counts: 324, New Grounds, Mar. 24 and 189, Sept. 24 (LPA); 180, Chittening, Aug. 2–9 (NTL); 400, St. George's Wharf, Aug. 31 (SMT *et al.*); 300, Sand Bay, July–Sept. (RA, RFH *et al.*).

WHIMBREL *Numenius phaeopus*

G. and **S.** Spring passage, Apr. 14—June 1 (40 reports, 21 from **G.**—mostly from New Grounds) with max., 40, New Grounds (TDE) and 30, Woodspring Bay (RA), both on May 9. Autumn passage, July 9—Sept. 22 (31 reports, 14 from **G.**) with max., 29, New Grounds, Aug. 2 (LPA) and 10, Sand Bay, on 5th (RA).

BLACK-TAILED GODWIT *Limosa limosa* *See page* 580.

G. 34 reports. Up to four, New Grounds, Apr. 9 — May 19 and up to 14, July 6–Sept. 9. Up to 11, Chittening, March and July 27–Oct., but 100, Oct. 8–21 (NTL).

S. 18 reports. Two, Axe Estuary, Mar. 9 (RA). Up to three, Chew Valley res., Aug.–Sept., and up to ten, coast, July 27 to end year, but larger numbers, Weston Bay, Oct.–Dec., with 220, Oct. 4 (PC).

BAR-TAILED GODWIT *Limosa lapponica*

G. Reports (26) of up to 20, mostly from New Grounds, Mar. 24–May 15, with up to 58, early May; one or two, same place, June 29–Oct. 12.

S. Up to four, coast, Jan.–May 15 and Aug. 1–Dec., but occasionally 20–30, latter period; 85 over Sand Point, Sept. 28 (RA). One, Chew Valley res., Nov. 15 (RMC). 17 reports.

GREEN SANDPIPER *Tringa ochropus*

Fewer than usual; 15 records, **S.** coast and resrs., Jan.–Apr. 5, with max. of three, Kenn Moor, Mar. 22. 89 records (34 in **G.**) of up to three, June 27–Dec., mostly from New Grounds, St. George's Wharf (where 6, Oct. 4–WGB) and Chew Valley res. (where 5, July 30 and Aug. 9–RA, KEV).

WOOD SANDPIPER *Tringa glareola*

Single birds New Grounds (**G.**), June 13 (TDE); and Chew Valley res. (**S.**), July 20, Aug. 8 and 22nd (RJL, SJM, KEV) but two on 9th (RA).

COMMON SANDPIPER *Tringa hypoleuca*

Coastal reports (48 in **G.**, 9 in **S.**) of up to ten, Jan. 5–May 8 and

June 24–Dec. 30. Reservoirs: 40 reports, Cheddar and Chew Valley, of up to 17, Apr. 12–May 9 and up to nine, July 9–Dec. 31, with up to 22, August.

REDSHANK *Tringa totanus*

G. and **S.** Pattern as in 1967 but spring numbers lower—max., 30–35. Autumn peaks: 400–500, Chittening, Aug.–Sept. (NTL); 150, Sand Bay, Aug., Dec. (RA, SJP); 160, St. George's Wharf, Sept. 24 (WGB). Bred, latter place and Clevedon—R. Yeo.

SPOTTED REDSHANK *Tringa erythropus*

G. New Grounds (56 records): up to three, Mar. 25–June 20 then up to 20 to end Oct. with up to 30, September.

S. Records (50, incl. 39 from resrs.) of up to ten, Aug. 6 to end year; 16 over Sand Bay, Sept. 9 (PC, ADLE).

GREENSHANK *Tringa nebularia*

G. and **S.** Up to four, Apr. 30–May 28, July 13–Nov. 23, but up to 12, New Grounds and Chew Valley res., July–Sept. Five, Litton res., Oct. 13 and six, St. George's Wharf, Nov. 16. 98 reports.

KNOT *Calidris canutus*

G. and **S.** Noted all months except June. Only counts over *c.*20 were from Sand Bay–Axe Estuary, where up to 300, Feb.–Mar. and up to 100, Sept. 28–Dec., with 1,000, Dec. 26, (RA *et al.*).

PURPLE SANDPIPER *Calidris maritima*

G. Chittening: one or two, Mar. 29–May 7 and Dec. (NTL, JBOR).

S. Single birds, Brean Down, Feb. 23; Sand Point, Sept. 21–22 and Nov. 30 (RA *et al.*); Chew Valley res., Nov. 29 and Cheddar res., Dec. 8–29 (CRC, PC, SM, BR *et al.*)

LITTLE STINT *Calidris minuta. See page* 580.

G. and **S.** One, Corston, Jan. 5 (RH). Two, New Grounds, May 19 (LPA). Up to five, New Grounds, Chittening, Sand Bay and resrs., Aug. 11–Dec. 16 (LPA, RA, PC, RMC, BR *et al.*). 37 reports.

PECTORAL SANDPIPER *Calidris melanotos. See page* 580.

S. One, Cheddar res., Sept. 25 (BR). One, Chew Valley res., Sept. 29 (RSH *per* EMP).

BR's notes include: medium-sized wader, smaller than Ruff. Most distinctive feature—streaked breast made abrupt contrast with white belly. Lighter stripes on back. Head dark brown, with dingy eyestripe. Chin and throat light. Slender, longish bill, slightly decurved at tip. Very alert; seen alone and with Ruff and Little Stint. Fed near rocky ground and exposed mud.

DUNLIN *Calidris alpina*

167 records (77 from **G.**), all months. Max. counts: **G.**—1,500, New Grounds, Jan. 25–Mar. 9 and 1,500–2,000, Nov.–Dec. (TDE,

MAO, JDS *et al.*); up to 3,500, Severn Beach—Chittening, late Dec. (NTL, RGT); **S.**—4,500, Clevedon–R. Yeo, Jan. 12 (KEV); 3,000, Sand Bay, Dec. 13 (RA) and 2,000 on 29th (DJP); 2,700, Axe Estuary, Jan. 26 and 2,500–3,000, Dec. (RA).

CURLEW SANDPIPER *Calidris testacea. See page* 580.

G. and **S.** 57 reports, Aug. 25–Oct. 12, mainly from New Grounds area (max., 100, Aug. 31—JDS *et al.*), St. George's Wharf (max., 14, Aug. 31—WGB), Sand Bay (max., 25, Sept. 12—PC) and resrs. (up to four, Chew Valley). One, Clevedon (KEV) and one Cheddar res. (SJM), both on Nov. 16.

SANDERLING *Crocethia alba*

G. New Grounds: usually up to ten, Mar. 8–June 3 and July 13–Sept. 14, but up to 50, Apr./May and to 30+, Aug. 16. Up to 20, Chittening, May and one, Sept. 14.

S. Up to 7, coast, Jan. 5–May 18 (but 22, Sand Bay, Feb. 27–TB) and Aug. 12–Sept. 18; four, Axe Estuary, Dec. 20 (RA). Single birds, resrs.—Chew Valley, May 11 (JBOR *et al.*) and Cheddar, Sept., Nov. 26 and Dec. 25 (DJP, BK *et al.*).

RUFF *Philomachus pugnax*

Reports (120, 60 from **G.**), all months. New Grounds: peaks of 52, Mar. 14 (LPA) and 21, Sept. 28. Chew Valley res. (46 reports): one, Jan. 7, Feb. 22; up to ten, July 27 to end year, with up to 16, Sept. 21–23. Three, Cheddar res., Sept. 24–27.

AVOCET *Recurvirostra avosetta*

G. Fifteen, New Grounds, May 30–31 (LPA, TDE, KJ) and one flying up river, same place, June 13 (TDE).

S. Five, Sand Bay, Apr. 8 (RA, TB, PC); four, Clevedon, May 24–25 (AC, WBC, RGT). One, Cheddar res., Dec. 18 (BR).

RED-NECKED PHALAROPE *Phalaropus lobatus*

S. Ad. ♀ in partial moult, Chew Valley res., Aug. 24 (RJL). Bird retained much red on neck. Dark vermiculated markings on back. Underparts very white. Bill long, fine, dark. Legs dark.

ARCTIC SKUA *Stercorarius parasiticus*

S. A dark-phase bird off Sand Point, Oct. 2 (PC, DJP).

GREAT SKUA *Stercorarius skua*

S. One to N.E., Sand Point, July 27 (RA) and one, Chew Valley res., Sept. 13, 14 (RLJ, DJP, BR).

GREAT BLACK-BACKED GULL *Larus marinus*

S. The Steep Holm colony continues to decline—now 39 pairs compared with 95 in 1962 (S).

Lesser Black-backed Gull *Larus fuscus*

G. Over 160, Frampton Pools, Feb. 2 (BAO).

S. Steep Holm: 630 ± 50 pairs; pullus ringed 24.6.63 found dead, Casablanca (Morocco), *c.* 30.11.69 (S). Roost counts, Chew Valley res.: 1,100, Sept. 9 and 1,250 on 25th (PJC).

Herring Gull *Larus argentatus*

S. Over 1,000, Barrow Gurney resrs., Feb. 22—off to roost at Chew Valley res., Steep Holm and mouth of Avon (PJC). Steep Holm breeding colony now 5,070 ± 200 pairs, up 43% on 1956 census total (S). 3,000 roosting, Chew Valley res., Sept. 25 (PJC).

Common Gull *Larus canus*

G. One, ringed as pullus, Texel, Holland, June 23, found ailing, Cromhall, Dec. 19—died later (JH).

S. 600, King Down Farm, nr. Cheddar, Feb. 5 (EMP).

Glaucous Gull *Larus hyperboreus*

S. First-winter bird, Chew Valley res., Feb. 16 (PJC, SEC, SJM).

Little Gull *Larus minutus*

G. Up to three first-summer birds, New Grounds area, May 11–July 20 (LPA, KJ, CMS *et al.*).

S. Chew Valley res.: one, August but four on 17th and six on 21st; two, Sept. 18–21; one, Nov. 9 and 30th but three on 22nd; two, Dec. 23 and one on 28th (PLG, RCP, KEV *et al.*).

Kittiwake *Rissa tridactyla*

G. and **S.** Movements in Estuary, up to mid-June, larger than usual: 40, Brean Down and 270, New Grounds, Mar. 31; 70, latter place, Apr. 11. Steep Holm: 30, May 6; 70 on 9th; 40 on 31st and 20, June 14 (LPA, RMC, BR *et al.*) Two, Chew Valley res., Mar. 30 and Apr. 14. One, Frampton Pools, Sept. 18; one, Sand Point on 19th, four on 28th and two each on 30th, Nov. 9 and Dec. 14. One off Brean Down, Nov. 16 (DJP, JBOR, MS *et al.*).

Black Tern *Chlidonias niger*

G. and **S.** Many records from Frampton Pools and N. Somerset resrs., usually of up to five, end June and end July to mid-Sept., but large passage, Aug. 9–11, with max., *c.*50, Chew Valley on 9th and 106, New Grounds, on 11th. Secondary passage, early/mid Sept.; last dates: single birds, Middle Hope, Sept. 28; Chew Valley res., Oct. 18.

White-winged Black Tern *Chlidonias leucopterus*. *See page* 580.

S. First-year bird feeding with four Black Terns, Barrow Gurney resrs., Sept. 7 (PJC). Record (7th for area) accepted by *Brit. Birds* Rarities Committee.

Common Tern *Sterna hirundo* Arctic Tern *Sterna macrura*

G. and **S.** Noted in all months, Apr.–Sept., with no clear break between passages. Small influx with Black Terns, Chew Valley res.—25, Aug. 9. Only other large numbers–18, New Grounds, May 6, and 12, Blagdon, Aug. 12 (LPA, RAr, TRC *et al.*).

Little Tern *Sterna albifrons*

G. and **S.** Single birds, New Grounds, May 14 and June 17 and two, Frampton Pools, June 29 (LPA, TDE). Two, Clevedon, Apr. 26 (WBC, GW). Chew Valley res.: one, May 11 (KDS); five, Aug. 8 and one, 24th (KEV *et al.*). Single birds, Cheddar res., Sept. 8 (BR) and 16th (ADLe); and Axe Estuary, Sept. 15 (RA).

Sandwich Tern *Sterna sandvicensis*

G. and **S.** More records than usual. Single birds, Frampton Pools and Weston-s-Mare, Apr. 12; Cheddar res., Apr. 13 and Chew Valley res. on 17th. Six, New Grounds and three over reed-bed, May 4. Two, Cheddar res., July 16. One, Sand Bay, Aug. 29, Sept. 28 and two, New Grounds, Sept. 23 (RA, RKB, PLG, MGW *et al.*).

Razorbill *Alca torda*

S. A headless corpse washed up, Sand Bay, Apr. 20 (RA).

Guillemot *Uria aalge*

S. One, Weston Bay, Aug. 26 (CRB).

Stock Dove *Columba oenas*

Three nests, Steep Holm, May—first breeding record for island —and up to thirteen birds, autumn (S). Largest flock: 100 or more, King Down Farm, Cheddar, Feb. 5 (EMP).

Turtle Dove *Streptopelia turtur*

G. and **S.** Twenty-four widespread records (44 in 1968), Apr. 29—Sept. 17. Flock of 18, New Grounds, May 22 (LPA).

Collared Dove *Streptopelia decaocto*

G. and **S.** Reported widely, all months. Flock of 70 on stubble, Backwell, July 28 (GEC). City of Bristol: several thriving colonies; eggs laid, Redland, early Jan.; seen taking grit from middle of road among busy traffic (CG).

Cuckoo *Cuculus canorus*

G. and **S.** Reports (66) from 21 localities, including juvs., at Filton, Bishop Sutton and Clevedon, and one, Sand Point, fed by Meadow Pipit which sometimes perched on its back (RA).

Nightjar *Caprimulgus europaeus*

S. Mendip Lodge: five birds seen and about ten others heard, June 14, and four seen and four others heard, 29th (RLJ, DJP). Two heard, Blackdown, Mendip, Aug. 1 (ADLe).

Lesser Spotted Woodpecker *Dendrocopus minor*

Single birds: **G.**—Frampton Pools, Jan. 2 and R. Severn, Frampton, Aug. 16 (TDE); Aust, Aug. 8, long dead (BJG); Cromhall, Sept. 19 (JH); **S.**—Chew Valley res., Apr. 17 (PLG), Sept. 8 (JBOR) and Oct. 18 (RA); Backwell, Apr. 19 (GEC); Chew Stoke, May 2 (PGF); Hunstrete Lake, Aug. 10 and Stanton Prior, Dec. 27 with two, latter place, previous day (MS). Pair ousted from nest, Chew Valley res., by Tree Sparrows (SJM *et al.*).

Wryneck *Jynx torquilla*

S. At least two, Blackdown, Mendip, Aug. 1 (ADLe); single birds, Sand Bay, Sept. 5 (CRB, PC), Sand Point, 16th (RA) and 28th (HGH, IMH), and Emborough, 20th (RSH).

Woodlark *Lullula arborea*

S. Sand Point: one, Sept. 23; two, Oct. 5 (TB).

Shorelark *Eremophila alpestris*

G. One, New Grounds, Nov. 8 (TDE).

S. One, Cheddar res., Nov. 10–end year (PJC, BR *et al.*).

Sand Martin *Riparia riparia*

G. and **S.** Bred in wall drains, St. Werburgh's (Bristol), and Keynsham, and in river bank, Frome.

Raven *Corvus corax*

G. Three, New Grounds, Jan. 29; one, Feb. 2. Two, Whitcliff Park, Nov. 23.

S. Up to five, Brean Down area, all year—probably bred. Two, Loxton, Jan. 18, and Rowberrow Plantation, Jan. 29, Apr. 2. Single birds, Nailsea, Jan. 14 and Apr. 1; Cheddar Gorge, Aug. 2 and 14th; Cheddar res., Nov. 3 and Chew Valley res., Nov. 22.

Hooded Crow *Corvus cornix*

S. One, St. George's Wharf, Dec. 14 and 21st (WGB, GAF *et al.*).

Willow Tit *Parus atricapillus*

G. Single birds, Frampton Pools, Feb., Mar. and Nov. (TDE).

S. One trapped, Chew Valley res., Apr. 7 (C).

Bearded Tit *Panurus biarmicus*

G. Up to four, Frampton Pools, Jan. 4–Mar. 23 (LPA, BAO *et al.*) —present since Dec. 14, 1968.

Dipper *Cinclus cinclus*

G. Pairs throughout year, R. Boyd, Wick (DRH) and R. Frome, Bristol (PLG, SJM); no proof of breeding. One, Kilcott, Apr. 20 (D).

S. Single birds, R. Chew (Pensford), Nunney and Midford Brooks and R. Frome, Mar.–May and Nov. (RMC, RH *et al.*).

RING OUZEL *Turdus torquatus*

G. One, N. Nibley, Mar. 29 (D).

S. Pairs, Mar. 22 at Brean Down (RMC) and Weston-s-Mare airfield (CRB). Single birds, Sand Point, Mar. 23, Sept. 3 and 22nd; Wavering Down, Apr. 10; Portishead–Clevedon, Sept. 14 and Brean Down on 20th (RA, TBS *et al.*).

WHEATEAR *Oenanthe oenanthe*

G. and **S.** 50 reports (25 in **G.**), widespread localities, Mar. 16 –June 5 and Aug. 1–Nov. 2.

STONECHAT *Saxicola torquata*

G. and **S.** Breeding reported, Aust, Brean Down, Winscombe Hill–Crook Peak (8 prs. noted), and old airport, Whitchurch (PGF, BJG, AMR). Breeding season reports also from Sand Point, Brockley Combe and Wrington Warren.

WHINCHAT *Saxicola rubetra*

G. Three, Wotton-u-Edge, Sept. 17. Single birds, Frampton area, Frocester and Filton, Aug. 1–Sept. 22.

S. Breeding reported from old airport, Whitchurch; Nailsea Moor; and Blackdown and North Hill, Mendip. Reports (15) of up to six from coast, Cheddar and Chew Valley resrs., Long Ashton, Brockley Combe and Stowey Sutton, Apr. 6–Sept. 19.

REDSTART *Phoenicurus phoenicurus*

Single birds: **G.**—Durdham Down and Downend (Bristol); **S.**—Ashton Park, Long Ashton, Steep Holm, Woodspring Priory, Kewstoke, Bleadon Hill, Velvet Bottom, Chewton Mendip, North Stoke and Solesbury Hill (Bath), Apr. 30–Sept. 4.

BLACK REDSTART *Phoenicurus ochrurus*

S. Single birds, Sand Point, Jan. 5 and 8th, and Feb. 8 and 9th (RA, PJC, DW), Clevedon, Sand Point, Brean Down and Cheddar res., Sept. 9–Dec. 18 (RH, TBS, AJT *et al.*).

NIGHTINGALE *Luscinia megarhyncha*

G. and **S.** Breeding proved, Filton, Oakford, Newton St. Loe and Midford. Reports of singing ♂♂, Apr. 27 – May 31, from Littleton upon Severn, Inglestone Common and Lower Woods, Henbury (Bristol), Leigh Woods, Shipham and localities round Bath.

AQUATIC WARBLER *Acrocephalus paludicola*

S. One trapped, Blagdon res., Aug. 24 (PJC) is fifth record for County. Record accepted by *Brit. Birds* Rarities Committee.

BLACKCAP *Sylvia atricapilla*

G. and **S.** Wintering single birds reported from Bristol (HRHL), Clevedon (AJT) and Bath (BATH).

Chiffchaff *Phylloscopus collybita*

G. One, Frampton on Severn, Jan. 5, showed characteristics of the northern race *tristis* (TDE).

S. One of race *P. c. tristis* trapped, Steep Holm, Oct. 6 (S).

Wood Warbler *Phylloscopus sibilatrix*

Breeding season reports of up to three from: **G.**—Dursley; Winterbourne; Blaise Castle, Stoke Park and R. Frome, Bristol; and **S.**—Leigh Woods, Brockley Combe, Goblin Combe, Clevedon, Weston Woods, Blagdon res. and Ebbor Gorge.

Firecrest *Regulus ignicapillus*

G. Male, Frampton Pools, Feb. 22; two, Dec. 14–31 (TDE).

S. Single birds trapped, Steep Holm, Oct. 9 and 12 (S).

Pied Flycatcher *Muscicapa hypoleuca*

G. and **S.** Single birds, Cattybrook, Apr. 13 (EL) and Tockington, 20th (AEB). Male, Mells, Apr. 27 (BR); ♀ or imm. found dying, Failand, Sept. 9 (F).

Richard's Pipit *Anthus richardi*

S. One, R. Kenn Estuary, Jan. 12 and 13th (JBOR, KEV). Record accepted by *Brit. Birds* Rarities Committee.

Tree Pipit *Anthus trivialis* *See page* 581.

G. and **S.** Reports (29) from 16 localities, Apr. 6–Oct. 4.

Rock Pipit *Anthus spinoletta petrosus*

S. Inland records: up to three, Cheddar res., Mar. 24 and 25th (BR) and Nov. 10–Dec. 17 (PJC, RMC, PLG); one, Mar. 25, showed characteristics of the race *littoralis* (BR).

Water Pipit *Anthus spinoletta spinoletta*

G. Single birds, showing characteristics of this race, Frampton on Severn, Nov. 8 and 9th (RKB, TDE).

S. Reports (31) of up to five, Cheddar and Chew Valley resrs., Jan.–Apr. 4 and Nov. 10–Dec., with at least ten, Dec. 21 (KEV).

Pied Wagtail *Motacilla alba yarrellii*

G. Roost, old factory, Temple Way, Bristol (CG). At least 60 present, Apr. 4 and 200, Nov. 26.

White Wagtail *Motacilla alba alba*

G. and **S.** Two, Frampton Pools, Apr. 26 and one, Estuary, May 17 (TDE); two, New Passage, May 3 (HWN). Up to seven, Chew Valley res., Apr. 10–27th; one, June 29.

Yellow Wagtail *Motacilla flava* *See page* 581.

Red-backed Shrike *Lanius collurio*

S. Male, Chew Valley res., Aug. 28 (MS).

HAWFINCH *Coccothraustes coccothraustes*

G. One, Kingsweston Woods (Bristol), Mar. 24 (RLB).

S. Up to four, Leigh Woods, Woolard, Midford and Rainbow Wood (Bath), Feb. 28–June 8, Nov. and Dec. (RMC, MS *et al.*).

SISKIN *Carduelis spinus*

G. Up to 250, Frampton Pools, Jan. 19–Mar. 21 (RKB, JDS *et al.*), and up to 21, Fishponds, Bristol, Feb. 14–24th (BLK). Two, Frenchay, Bristol, Mar. 26, and Dursley, Apr. 6.

S. Reports (31) of up to 100, mainly from coast and resrs., Jan.–May 4 and Sept. 28–December.

REDPOLL *Carduelis flammea*

G. and **S.** Reports (57) of up to 30 from twenty-two inland and coastal localities, Jan.–May 12 and Aug. 1–December.

SERIN *Serinus canarius* *See page* 581.

S. Four, Yeo Estuary, Feb. 16 (KLF, RJS, KEV). Record accepted by *Brit. Birds* Rarities Committee.

CROSSBILL *Loxia curvirostra*

S. Two, Blagdon res., Jan. 19 and one, Dec. 23 (RLJ, DJP).

BRAMBLING *Fringilla montifringilla*

G. and **S.** Reports (37) of up to 100 from 20 localities, Jan.–Apr. 9 and Oct. 12–December.

CORN BUNTING *Emberiza calandra*

G. Count of 66 singing ♂♂, Tormarton–Marshfield–Acton Turville area, June 25 and 26th (NJC). Up to three, Tog Hill, West Littleton and Mangotsfield (NJC, BJG).

S. Up to ten, Sand Bay, Cheddar, Draycott, Westbury, Ubley, Yoxter (Mendip), Charterhouse, Stoke Hill, Harptree Hill, Rowberrow Warren, Dundry, Burnett, Charmy Down and Lansdown.

CIRL BUNTING *Emberiza cirlus*

One or two reported, all months, from: **G.**—Aust and Horseshoe Bend, R. Avon (Bristol); and **S.**—Sand Point, Winscombe, Banwell and Cheddar res., with up to seven, latter place, in December.

SNOW BUNTING *Plectrophenax nivalis*

Reports of up to eight from: **G.**—New Grounds and **S.**—Sand Bay and Cheddar and Chew Valley resrs., Feb. 1–Mar. 30 and Nov. 5–Dec. 9 (LPA, TB, MAO *et al.*).

TREE SPARROW *Passer montanus*

G. and **S.** Reports (22) of up to 30 from ten localities, all months. Fifty, Kingston Seymour, Aug. 23 (JJ).

OTHER COMMON OR REGULARLY OCCURRING SPECIES PRESENT (those marked * are mentioned in the Foreword).

Residents: Little Grebe, Mallard*, Teal, Mute Swan*, Coot, Black-headed Gull, Tawny Owl, King-fisher, Green and Great Spotted Woodpeckers, Skylark, Carrion Crow, Rook*, Jackdaw, Magpie, Jay; Great, Blue, Coal, Marsh and Long-tailed Tits; Nuthatch, Treecreeper, Wren, Mistle Thrush, Song Thrush*, Blackbird, Robin, Dunnock, Meadow Pipit, Grey Wagtail, Starling*, Greenfinch, Goldfinch, Linnet, Bullfinch, Chaffinch, Yellowhammer, Reed Bunting, House Sparrow.

Summer or Winter visitors or passage migrants: Swift*, Swallow*, House Martin*, Fieldfare, Redwing; Grasshopper, Reed, Sedge and Garden Warblers, Whitethroat*, Lesser Whitethroat*, Willow Warbler, Spotted Flycatcher.

BOUNDARY OF THE BRISTOL DISTRICT

From Jan. 1, 1968, the boundaries of the area covered by this report were changed in order to facilitate consistent recording. The District is now defined as follows:

that part of Glos. lying east of the Severn, bounded on the N. by the R. Frome from its mouth at Arlingham Bend inland to Dudbridge, then by its tributary S. to Avening, then by the A 434 road through Tetbury to the Wilts. border; and that part of Somerset bounded on the S. by the R. Axe from its mouth to Wookey, and then by the B 3139, A 371, A 361 and B 3098 roads through Wells, Shepton Mallett and Frome to the Wilts. border. Brean Down, Steep Holm and The Denny are deemed to lie within the area.

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LEPIDOPTERA NOTES BRISTOL DISTRICT, 1969

BUTTERFLIES

By A. D. R. Brown

A large quantity of information was again received by the author, including some very unusual records of rare species observed locally. With the extensive collection of butterfly records over the past eight years, we have decided to make good use of them, and for the first time, a series of distribution maps on selected species of special interest has been included with this report. The range and status of the selected species has fluctuated considerably, and we have seen many drastic changes take place in recent years. The report now concentrates on observations from vice-counties West Gloucestershire (**G.**) and North Somerset (**S.**), since we are now co-operating with the Monks Wood lepidoptera mapping scheme, which collects and correlates records on this regional basis.

The distribution maps represent all the localities within the two vice-counties, from which records were received over the period 1962 to 1969. In some cases, two species are included on one map, and this is intended to give an idea of the relative distributions of closely related species from the same families exhibiting similar habits.

As far as 1969 was concerned, this was a very good year for our local butterflies, and this fact can probably be attributed to the prolonged sunny spell during the summer months. A report of the exotic and very rare Purple Emperor butterfly (*Apatura iris* L.) from North Somerset was sent in by a famous entomoligist and authority on the species, and a new colony of the Duke of Burgundy Fritillary (*Hamearis lucina* L.) was discovered in the Cotswolds. Migrations of the Red Admiral (*Vanessa atalanta* L.) and Painted Lady (*Vanessa cardui* L.) were particularly good during the year, but no reports of the Pearl-bordered Fritillary (*Argynnis euphosyne* L.), High Brown Fritillary (*Argynnis cydippe* L.) or Purple Hairstreak (*Thecla quercus* L.) were received.

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Pararge aegeria L. (Speckled Wood)

As with many other species, 1969 was a very good year for the Speckled Wood with an increase in numbers over the whole area, and in North Somerset particularly.

Despite the period of warm sunny weather in early April, only individual specimens were noted on the wing during the first part of the first generation in May. The earliest record was that of one seen at Shipham (**S.**) on May 1 (T.B.S.)

What was presumably the second part of the first generation appeared in mid-June, and the species was particularly abundant up until the end of that month.

From the information received, it is difficult to say exactly when the second generation appeared, although records point to the fact that there was a peak emergence in late August, following the unusually long hot spell. Very large numbers were observed in both vice-counties at the time, and this probably represented the second part of the second generation. The autumn was also fine, and specimens were continually seen on the wing up until the end of October. The last record was that of two noted at Charfield (**G.**) on Oct. 20 (M.G.K.).

Pararge megera L. (Wall Brown)

Numbers were down compared with the previous year, although a substantial increase of records were received.

G. Almondsbury: small numbers from June 3 to Aug. 18 (D.G.G.); Clifton Down, Bristol: 2 on Aug. 5, 5 on Aug. 16 (T.B.S.); West Kington: 1 on June 25 (N.C.); Dursley: 1 or 2 on May 31 (D.R.H.); Wick,: 2 or 3 on August 17, a few on Aug. 31 (D.R.H.); Filton: 2 on June 23 (C.W.W.); Stoke Park, Bristol: seen on Aug 7, 2 on Aug 24 (B.L.K.); Haresfield: several of each sex on May 22 (A.D.R.B. & C.W.W.); Charfield: 1 on Aug 20, 2 on Aug 28 & 31, 4 on Sept 2, 1 on Sept 4 (M.G.K.); Stinchcombe: several of each sex on May 22 (A.D.R.B. & C.W.W.); Saddlewood Roughs: seen on Aug. 16 (M.G.K.).

S. Shapwick Heath: 1 male on Aug. 26 (J.F.B.); Sand Point: 8 on June 8, 6 on Aug. 31, 1 on Sept. 7 (R.A.); Hinton Charterhouse: 1 on Sept. 17, 2 on Sept. 19, 20, 21, 28 & Oct. 5 (D.Ws.); Charmy Down: 1 on June 28 (N.C.); Hutton: seen on Aug. 27 (K.H.P.); Shipham: 1 on June 12 & 17 (T.B.S); Crook Peak: 3 on Aug 3 (N.C.); Sandford Hill: 2 on June 7 (T.B.S.); West Huntspill: 1 on June 9 (T.B.S.); Brean Down: 1 on May 1 and June 1 & 10 (R.A.); Charterhouse: 1 on June 14 (T.B.S.); Cadbury Camp: 1 on Aug. 24 (T.B.S.); Clevedon: 1 on Sept. 7 (T.B.S.); Ashton Plantation: 1 on Aug. 20 (T.B.S.).

Melanargia galathea L. (Marbled White)

Reasonably common in its usual haunts, but not as abundant as in the previous year, although many records from new localities were received See fig. 1.

Eumenis semele L. (Grayling)

Records received of specimens from only one of its regular localities.

S. Sand Point: 3 on July 13, 1 on July 7, 4 on July 27, 6 on Aug. 3, 1 on Aug. 9 & 17 (R.A.).

Maniola tithonus L. (Hedge Brown)

The species was again fairly common in its usual haunts, but numbers were down considerably on the previous year.

Maniola jurtina L. (Meadow Brown).

Abundant as usual, with records of many strong colonies. As in 1968, the first specimen was observed at Shipham (**S.**) on June 13 (T.B.S.), while the final reports were of four seen at Sand Bay (**S**·) on October 17 (T.B.).

Coenonympha pamphilus L. (Small Heath)

Very common in many widespread localities, and there is substantial evidence that the species is on the increase. The first examples were noted at Stinchcombe (**G.**) and Haresfield (**G.**) on May 22 (A.D.R.B. & C.W.W.).

Aphantopus hyperanthus L. (Ringlet)

A common species in certain localities, but generally rather scarce and in small numbers.

G. Inglestone Common: many battered specimens of each sex on July 20 (C.W.W.); Saddlewood Roughs: seen on Aug. 2 (M.G.K.).

S. Cadbury Camp: 3 on July 5 (N.C.); Worlebury: 6 on July 19, 2 on Aug. 2 & 16 (R.A.); Crook Peak: frequent during July and August (N.C.) Lower Failand: 1 on Aug. 1 (T.B.S.); Weston Wood: 1 on Aug. 3 (R.A.)

Argynnis selene Schiff. (Small Pearl-bordered Fritillary)

G. Stratton Common: numerous on Aug. 30 (I.F.G.).

S. Charterhouse: 2 on June 14 (T.B.S.).

Argynnis aglaia L. (Dark Green Fritillary)

Common in its old haunts.

G. Stinchcombe: many on July 11 & 23 (D.G.G.).

S. Crook Peak: common during August (N.C.); Sand Point: 4 on July 27, 3 on Aug. 3 (R.A.).

Argynnis paphia L. (Silver Washed Fritillary)

G. Wickwar: single battered specimens of each sex on July 20 (C.W.W.); Saddlewood Roughs: 1 on Aug. 2 & 16 (M.G.K.).

Euphydryas aurinia Rott. (Marsh Fritillary)

S. Charterhouse: plentiful on June 14 (T.B.S.); Chilton Heath: 1 on June 28 (T.B.S.).

Vannsesa atalanta L. (Painted Lady)

Common and widespread in many localities. The first specimen was observed at Winterbourne (**G.**) on July 27 (B.L.K.), while the last was seen in Charfield (**G.**) on Nov. 13 (M.G.K.).

Vanessa cardui L. (Painted Lady)

Many more records received than previous years, the first example being seen at Sand Point (**S.**) on May 25 (R.A.), while the last was recorded at the same locality on Nov. 5 (T.B.). The maximum number observed on one occasion was 15 from Clevedon (**S.**) on Aug. 10 (T.B.S.)

Aglais urticae L. (Small Tortoishell)

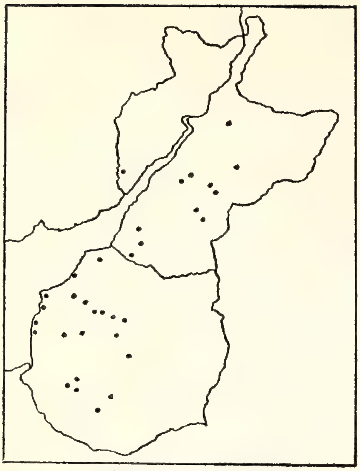
Smaller numbers were seen than in 1968, although the species is still very common and widespread in the two vice-counties.

The first specimens began to emerge from hibernation in early March and April, the earliest observation being of one from Shipham (**S.**) on Mar. 6 (T.B.S.). Varying numbers were noted prior to the first brood, and the maximum were 10 from Filton (**G.**) on Arpl. 9 (R.A.).

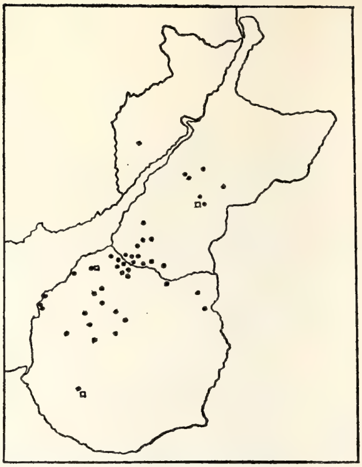
From the limited amount of information received, it appears that the first generation appeared on the wing in mid-May, but in early August there was a peak emergence which continued through September into late October. This presumably represented the second generation. A single specimen was noted at Wick (**G.**) on Nov. 26 (D.R.H.), but no later observations were made.

Nymphalis io L. (Peacock)

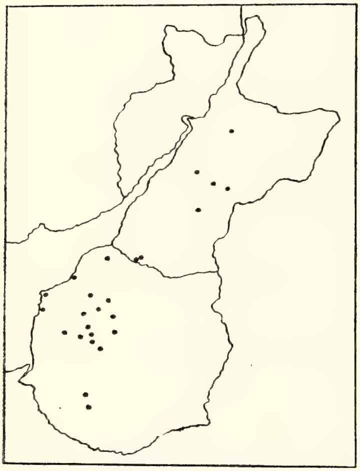
Very common and widespread over the whole area, the first specimen being recorded from Weston Wood (**S**). on Apr. 4 (R.A.). On Nov. 22, individual butterflies were noted from Wick (**G.**) (D.R.H.) and Chew Valley Lake (**S.**) (R.M.C.).



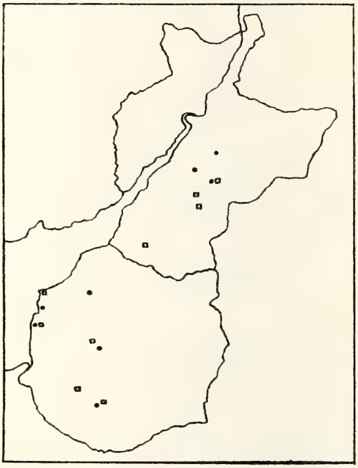
Melanargia galathea Linn.
(Marbled White)



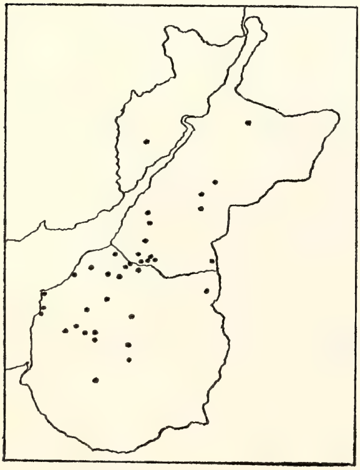
●*Polygonia c–album* L. (Comma)
□*Limenitis camilla* L. (White Admiral)



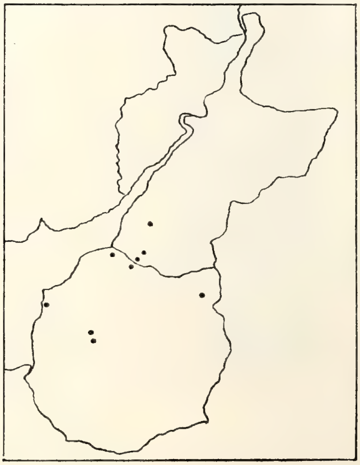
Aricia agestis Schiff. (Brown Argus)



●*Lysandra coridon* Poda (Chalkhill Blue)
□*Lysandra bellargus* Rott, (Adonis Blue)



Anthocharis cardamines Linn.
(Orange Tip)



Sphinx ligustri L. (Privet Hawk-moth)

Polygonia c-album L. (Comma)

The species was recorded from many widespread localities, but never common. The earliest report was one from Wick (**G**). on Mar. 8 (D.R.H.), while the latest was seen in Portishead (**S.**) on Oct. 14 (T.B.S.) See fig. 1.

Limenitis camilla L. (White Admiral)

G· Wickwar: 7 worn males and females on July 20 (C.W.W.). See fig. 1.

Apatura iris L. (Purple Emperor)

A female specimen of this exceedingly rare species was seen for the first time on July 22, after a lapse of fifty-one years in a famous old haunt in North Somerset. This is most encouraging, and the evidence suggests that the species, which was thought to be extinct in this locality, has just been overlooked (I.R.P.H.).

Hamearis lucina L. (Duke of Burgundy Fritillary)

G. The species enjoyed a good year, and many examples were seen at two remote localities in the northern Cotswolds in late May (A.D.R.B. & C.W.W.).

Cupido minimus Fuessl. (Small Blue)

S. Weston-super-Mare: 4 on June 6 (K.H.P.).

Aricia agestis Schiff. (Brown Argus)

Very scarce during 1969, although many records were received. See fig. 1.

Polyommatus icarus Rott. (Common Blue)

Widespread and common in many localities, especially those in North Somerset.

The first generation appeared in force during the latter half of May and the first half of June, the earliest record being of one from Sand Point (**S.**) on May 11 (R.A.).

In early August the second generation came on the wing, and good numbers were noted up to the end of the month, when they began to die off, but a single straggler was observed on Oct. 17 in the same place as the first specimen (T.B.).

Lysandra coridon Poda (Chalkhill Blue)

This is still a very local species in the two vice-counties, although it was reported from Stinchcombe (**G.**) once again after an absence of two years (D.G.G.) See fig 1.

Lysandra bellargus Rott. (Adonis Blue)

Encouraging reports of this rare species were received from a previously unrecorded locality in North Somerset (R.A.), but no observations were made of the second generation. See fig. 1.

Celastrina argiolus L. (Holly Blue)

Still extremely scarce and local, but a marked increase in numbers was observed in Westbury-on-Trym (**G.**) during the summer brood (C.W.W.).

G. Almondsbury: 1 on May 22, 2 on Aug. 7 (D.G.G.); Inglestone Common: 1 on June 8 (D.G.G.); Clifton Down, Bristol: 1 on Aug. 5 (T.B.S.); Haresfield: 1 on May 22 (A.D.R.B. & C.W.W.); Stinchcombe: 3 on May 22 (C.W.W.); Westbury-on-Trym: 1 male on Apr. 29, 3 on Apr. 30, 1 on May 1 and 3, 1 on July 18, 21,& 22 (C.W.W.); Wick: 1 on May 12 and June 8 (D.R.H.).

S. Abbots Leigh: 1 on Aug. 5 & 16 (T.B.S.).

Lycaena phlaeas L. (Small Copper)

Once again, another good year for the species, the last specimen on the wing being observed at Abbots Leigh (**S.**) on Oct. 24 (T.B.S.).

G. Charfield: 1 on Oct. 2 & 16 (M.G.K.); Filton: 5 on Aug. 7, 1 on Aug. 20 (R.A.); Stoke Park: seen on Aug. 7 (B.L.K.); Wick: a few on Aug. 3, common on Aug. 17 (D.R.H.).

S. Cadbury Camp: 2 on Aug. 24 (T.B.S.); Charterhouse: 2 on June 14 (T.B.S.); Abbots Leigh: 2 on Aug. 16, 1 on Aug. 25 and Oct. 9, 17 & 24 (T.B.S.); Clevedon: 1 on Aug. 1 (J.F.B.); Crook Peak: 1 on July 30 and Aug. 6 (N.C.); Sand Bay: 4 on Oct. 5 (R.A.), 3 on Oct. 17 (T.B.); Shapwick; several on Aug. 26 (J.F.B.); Shipham: 1 during May (T.B.S.).

Callophrys rubi L. (Green Hairstreak)

G. Inglestone Common: a few on June 8 (D.G.G.); Haresfield: many on May 22 (A.D.R.B. & C.W.W.); Stinchcombe: plentiful on May 22 (A.D.R.B. & C.W.W.).

S. Cheddar: 1 on May 27 and June 7 (T.B.S.); Sandford Hill: 2 on June 7 (T.B.S.).

Strymon w-album Knoch (White Letter Hairstreak)

G. Saddlewood Roughs: seen on Aug. 16 (M.G.K.).

S. Weston-super-Mare: 1 pupa on June 12, from same Wych Elm as in previous years (K.H.P.).

Pieris brassicae L. (Large White)

Particularly common this year, the first specimen being seen on Apr. 5 in Clevedon (**S.**) (J.F.B.), while the last record was of two observed at Sand Bay (**S.**) on Oct. 17 (T.B.).

Pieris rapae L. (Small White)

Fairly numerous in many places, but never abundant. The first observation was of a specimen noted in Filton (**G.**),whereas the final record was one from Abbots Leigh (**S.**) on Oct. 17 (T.B.S.).

Pieris napi L. (Green-veined White)

Generally very common, perhaps more so than the two previous species, judging from the information received. The first specimen was seen in Westbury-on-Trym (**G.**) on Apr. 20 (C.W.W.), while in the second generation, a recurrent dwarf form appeared from time to time, mainly in June.

Colias croceus Fourc. (Clouded Yellow)

As with other migratory species, the Clouded Yellow was around in reasonable numbers in southern England, although only five examples were recorded from the two local vice-counties.

G. Upper Eastville, Bristol: 1 on Sept. 27 (B.L.K.).

S. Sand Bay: 1 on Oct. 5 (R.A.), singles on Oct. 9, 10 & 17 (T.B.).

Anthocharis cardamines L. (Orange Tip).

Much more common than in 1968, with observations from many new haunts in West Gloucestershire. See fig. 1.

Gonepteryx rhamni L. (Brimstone)

On the whole, specimens appeared from hibernation later than usual, but one male was noted near Filton (**G.**) on Mar. 6 (C.W.W.). The summer brood emerged in early August, and examples were seen regularly through that month to September into mid-October.

Erynnis tages L. (Dingy Skipper)

G. Stinchcombe: many on May 22 (C.W.W.); Haresfield: many on May 22 (C.W.W.); Wotton-under-Edge: many on May 22 (C.W.W.).

S. Charterhouse: common on May 30 and June 14 (T.B.S.); Cheddar: 2 on May 27 and June 7 (T.B.S.); Sandford Hill: at least 5 on June 7, 2 on June 15, 1 on June 24 (T.B.S.); Shipham: 2 on May 21 & 26, 3 on June 7 (T.B.S.).

Pyrgus malvae L. (Grizzled Skipper)

G. Filton: 2 on Aug. 7 (R.A.).

S. Charterhouse: 1 on June 14 (T.B.S.); Cheddar: 1 on May 27 and June 7 (T.B.S.); Sandford Hill: 1 on June 7 & 15 (T.B.S.).

Thymelicus sylvestris Poda (Small Skipper)

Generally common as in the previous year, with more records from W. Glos. The first specimen was seen near Filton (**G.**) on June 29 (C.W.W.)

Ochlodes venata Br. & Grey (Large Skipper)

Larger numbers than usual, the first specimen being recorded at Sand Point (**S.**) on June 4 (R.A.).

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ODONATA (Dragonflies):

Calopteryx (Agrion) virgo. One at Westhay (**S.**) on June 15 (T. B. Silcocks).

Libellula depressa. One male beside a small pond on the south side of Black Down, Mendip (**S.**) on June 30 (N. Collar); one at an equally small pond at Estcourt Park, Tetbury (**G.**) on July 12 (N. Collar).

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MOTHS

By K. H. Poole

THE following list has been compiled from records contributed by C. S. H. Blathwayt (C.S.H.B.), D. G. Gibb (D.G.G.), Mrs. M. E. Knight (M.E.K.), K. H. Poole (K.H.P.), and T. B. Silcocks (T.B.S.).

Migrant moths appear to have been few, but include *Herse convolvuli, Heliothis armigera, Nycterosea obstipata* and *Nomophila noctuella.* Among species not often recorded were *Spilosoma urticae, Atolmis rubricollis, Zenobia retusa, Cucullia absinthii* and *Zeuzera pyrina.*

Mormo maura, Apamea ophiogramma and *Deileptenia ribeata* do not appear to have been recorded in recent years.

Herse convolvuli L. (Convolvulous Hawk). Weston-s-Mare, Oct. 10* (C.S.H.B.).

Pterostoma palpina Cl. (Pale Prominent). Abbots Leigh, Aug. 2* (T.B.S.).

Thyatira batis L. (Peach Blossom). Abbots Leigh, July 21* (T.B.S.).

Asphalia diluta Schiff. (Lesser Lutestring). Leigh Woods, Sept. 5* (D.G.G.).

Tethea octogessima Hb. (Figure of Eighty), Almondsbury, several between June 11 and July 3* (D.G.G.).

Philudoria potatoria L. (Drinker). Charfield, July 30 (M.E.K.).

Nola cucullatella L. (Short-Cloaked), Abbots Leigh, July 5, 11, 12, 13* (T.B.S.).

Drepana cultraria Fab. (Barred Hook tip), Milton, Weston-s-Mare, June 5* (K.H.P.).

D. falcataria L. (Pebble Hooktip), Abbots Leigh, July 7, 27, Aug. 2, 3, 10, 11* (T.B.S.).

D. binaria Hufn. (Oak Hooktip), Abbots Leigh, Aug. 2* (T.B.S.).

Spilosoma urticae Esp. (Water Ermine), Shapwick, July 4* (K.H.P.).

Phragmatobia fuliginosa L. (Ruby Tiger), Abbots Leigh, July 24, Aug. 10, 18* (T.B.S.).

Atolmis rubricollis L. (Red-necked Footman), Weston-s-Mare, July 14* (C.S.H.B.), Amondsbury, 13 July* (D.G.G.), Milton, Weston-s-Mare, July 12* (K.H.P.).

Eilema griseola Hb. (Dingy Footman), Abbots Leigh, Aug. 31* (T.B.S.).

Colocasia Coryli L. (Nut-tree Tussock). Abbots Leigh, Aug. 3* (T.B.S.).

Apatele alni L. (Alder), Almondsbury, June 6 (2), 10, 11, 13* "becoming more frequent in this area." (D.G.G.), Milton, Weston-s-Mare, June 11* (K.H.P.).

A. leporina L. (Miller), Abbots Leigh, July 19* (T.B.S.).

Cryphia muralis Forst. (Marbled Green), Abbots Leigh, July 24, Sept. 10* (T.B.S.).

Agrotis exclamationis L. (Heart & Dart), Abbots Leigh, Oct. 26*, a late date (T.B.S.).

Amathes glareosa Esp. (Autumnal Rustic), Abbots Leigh, Sept. 7, 19, Oct. 13* (T.B.S.).

Lampra fimbriata Schreb. (Broad-bordered Yellow Underwing), Abbots Leigh, Aug. 31* (T.B.S.).

Polia nebulosa Hufn. (Grey Arches), Abbots Leigh, July 19* (T.B.S.).

Charaeas graminis L. (Antler), Abbots Leigh, Aug. 10, 18* (T.B.S.).

Aporophila nigra Haw. (Black Rustic), Abbots Leigh, Sept. 24* (T.B.S.).

Antitype chi L. (Grey Chi), Clevedon, Aug. 17* (T.B.S.).

A. flavicincta Schiff. (Large Ranunculus), Abbots Leigh, Sept. 3, 19, 20* (T.B.S.).

Griposia aprilina L. (Merveille du Jour), Abbots Leigh, Oct. 22* (T.B.S.).

Mormo maura L. (Old Lady), Abbots Leigh, Aug. 15* (T.B.S.).

Phalaena typica L. (Gothic), Abbots Leigh, July 26* (T.B.S.).

Parastichtis ypsilon Schiff. (Dingy Shears), Abbots Leigh, July 23* (T.B.S.).

Apamea scolapacina Esp. (Slender Brindle), Weston-s-Mare, July 30* (C.S.H.B.).

A. ophiogramma Esp. (Double Lobed). Shapwick, Aug. 1* (C.S.H.B.).

Procus literosa Haw. (Rosy Minor). Abbots Leigh, Aug. 8, 10* (T.B.S.).

Petilampa minima Haw (Small Dotted Buff), Weston-s-Mare, July 12* (K.H.P.).

Gortyna flavago Schiff. (Frosted Orange), Abbots Leigh, Aug. 10, 31, Sept. 3–26* (T.S.B.).

Cosmia affinis L. (Lesser-spotted Pinion), Almondsbury, Aug. 10* (D.G.G.), Milton, Weston-s-Mare, Aug. 8* (K.H.P.), Abbots Leigh, July 27* (T.B.S.).

Zenobia retusa L. (Double Kidney),Shapwick, Aug. 1*, a few (C.S.H.B.).

Z. subtusa Schiff. (The Olive), Abbots Leigh, Aug. 10* (T.B.S.).

Atethmia xerampelina Esp. (Centre-barred Sallow), Almondsbury, Sept. 8(2)* Leigh Woods, Sept. 5*, many (D.G.G.), Abbots Leigh, Aug. 30, 31, Sept. 1–24* (T.B.S.).

Anchocelis litura L. (Brown-spot Pinion), Almondsbury, Sept. 11* (D.G.G.). Abbots Leigh, Sept. 2* (T.B.S.).

Tiliacea aurago Schiff. (Barred Sallow), Abbots Leigh, Oct. 8, 14* (T.B.S.).

Citria lutea Ström. (Pink Barred Sallow), Abbots Leigh, Sept. 18* (T.B.S.).

Cirrhia gilvago Schiff. (Dusky Lemon Sallow), Abbots Leigh, Sept. 19, 23*,Oct. 4, 5* (T.B.S.).

Cucullia absinthii L. (Wormwood Shark), Abbots Leigh, July 24* (T.B.S.).

Heliothis armigera Hb. (Scarce Bordered Straw), Weston-s-Mare, Oct. 22* (C.S.H.B.).

Rivula sericealis. Scop. (Straw Dot), Abbots Leigh, July 19, 20, 27; Aug. 2 (5)* (T.B.S.)

Plusia bractea Schiff. (Gold Spangle), Weston-s-Mare, July 15* (C.S.H.B.).

Plusia gamma L. (Silver Y), Charfield. July 29–Oct. 19* (M.E.K.), Abbots Leigh, Nov. 23*, a late date (T.B.S.).

Catocala nupta L. (Red Underwing), Charfield, July 31 (M.E.K.), Milton, Weston-s-Mare, Aug. 23, Sept. 23* (K.H.P.), Abbots Leigh, Sept. 20, Oct. 22* (T.B.S.)

Laspeyria flexula Schiff. (Beautiful Hook-tip), Abbots Leigh, July 11, 12* (T.B.S.).

Bomolocha fontis Thunb. (Beautiful Snout), Weston-s-Mare, July 3* (C.S.H.B.).

Hypena proboscidalis L. (The Snout), Abbots Leigh, Oct. 20*, a late date (T.B.S.).

Pseudoterpna pruinata Hufn. (Grass Emerald), Abbots Leigh, July 23, 25, Aug. 2, 11* (T.B.S.).

Geometra papilionaria L. (Large Emerald), Abbots Leigh, July 27* (B.T.S.).

Scopula imitaria Hb. (Small Blood-vein), Abbots Leigh, July 4–Aug. 8* (T.B.S.).

Larentia clavaria Haw (Mallow), Abbots Leigh, Sept. 26* (T.B.S.).

Anaitis plagiata L. (Treble Bar), Weston-s-Mare, Aug. 23, 28*, both melanic (C.S.H.B.).

Lygris mellinata Fab. (The Spinach), Abbots Leigh, July 14* (T.B.S.).

L. pyraliata Schiff. (Barred Straw), Abbots Leigh, July 14, 15* (T.B.S.).

C. fulvata Forst. (Barred Yellow), Abbots Leigh, July 5* (T.B.S.).

Melanthia procellata Schiff. (Pretty Chalk Carpet), Abbots Leigh, July 15, 23, 27* (T.B.S.).

Discoloxia blomeri Curt. (Blomer's Rivulet), Almondsbury, July 3, 13* (D.G.G.), Abbots Leigh, July 19, 20, 27, Aug. 2(5)* (T.B.S.).

Eupithecia pulchellata Steph. (Foxglove Pug), Abbots Leigh, Sept. 1* (T.B.S.).

E. succenturiata L. (Bordered Pug), Abbots Leigh, Aug. 2* (T.B.S.).

E. subfulvata Haw. (Tawny Speckled Pug), Abbots Leigh, Aug. 10, 12, 29, Sept. 1, 6* (T.B.S.).

Chloroclystis coronata Hb. (V. Pug), Abbots Leigh, July 23, Aug. 2 (6), 4* (T.B.S.).

Horisme tersata Schiff (The Fern), Abbots Leigh, July 4–28* (T.B.S.).

Orthonama lignata Borkh. (Oblique Carpet), Abbots Leigh, Aug. 28* (T.B.S.).

Nycterosea obstipata Fab. (The Gem), Weston-s-Mare, July 18* (K.H.P.), Abbots Leigh, Sept. 18, 19, Oct. 13* (T.B.S.).

Campaea margaritata L. (Light Emerald), Abbots Leigh, July 9* (T.B.S.).

Apeira syringaria L. (Lilac Beauty), Abbots Leigh, July 9* (T.B.S.).

Ellopia prosapiaria L. (Barred Red), Abbots Leigh, Aug. 3* (T.B.S.).

Semiothisa alternaria Hb. (Sharp-angled Peacock), Milton, Weston-s-Mare, Aug. 13* (K.H.P.).

S. liturata Cl. (Tawny-Barred Angle), Clevedon, Aug. 17, Abbots Leigh, July 27, Aug. 10* (ab. nigrofulvata) (T.B.S.).

Itama wauaria L. (V-Moth), Abbots Leigh, July 4–19* (T.B.S.).

Deileptenia ribeata Cl. (Satin Carpet), Weston-s-Mare, Aug. 6, 7*, several (C.S.H.B.).

Zeuzera pyrina L. (Leopard) Almondsbury, 23 July,* (D.G.G.).

Hepialus sylvina L. (Orange Swift), Abbots Leigh, Aug. 15, Sept. 7* (T.B.S.).

Aphomia sociella L, Abbots Leigh, July 17* (T.B.S.).

Cataclysta lemnata L. Abbots Leigh, July 22* (T.B.S.).

Nomophila noctuella Schiff. Abbots Leigh,–common,* (T.B.S.).

Pyrausta olivalis Schiff. Abbots Leigh, July 6* (T.B.S.).

P. coronata Hufn. Abbots Leigh, Aug. 2, 8* (T.B.S.).

Hypsopygia glaucinalis L. Abbots Leigh, Aug. 2* (T.B.S.).

H. costalis L. Abbots Leigh, June 6* (T.B.S.).

*Species noted at light.

MAMMAL SURVEY BRISTOL DISTRICT, 1969

By Roger G. Symes

DURING 1969 the Mammal Section surveyed those parts of the Bristol district from which few records had previously been received so that a significant contribution could be made to the Mammal Society's national distribution maps which are soon to be published. These maps will show distribution recorded between 1965–1969 on the basis of 10km. squares of the National Grid whilst the Section's survey has been based on 1km squares and limited to the area described by Jones (1967). Trapping was carried out on all meetings using Longworth and Flap traps which are both designed to catch small mammals alive. The Flap traps, which are multi-catch, were made by Mr. A. F. Jayne and have proved to be a very cheap and successful alternative to the Longworth. Examination of discarded bottles for skulls of small mammals trapped inside yielded many valuable records, as did owl pellets. Field signs such as droppings and tracks which could be positively identified were recorded as well as localities of badger setts and fox earths.

Including the results from these surveys 548 records were received for 1969 from 50 observers, and 18 were first records of a species in a 10km square. Copies of records were forwarded to the Mammal Society and County Naturalist Trusts. Contributors of several records were:—E. R. Asprey (ERA), Miss K. Bagshaw, G. A. Baker, P. F. Bird (PFB), R. L. Bland, J. M. Boyd (JMB), J. F. Burton (JFB), R. J. Clark (RJC,) M. E. Collins, Miss M. Crichton, R. M. Curber, C. J. Dallinger, Miss J. D. Ethelston (JDE), P. L. Garvey (PLG), B. J. Gregory (BJG), H. R. Hammacott (HRH), J. Hodgson (JH), Mrs. A. R. Holeton (ARH), Miss E. Hurrell (EH), A. F. Jayne (AFJ), J. H. Kemp (JHK), Mrs. R. E. Knight, Miss M. Krajenski (MK), Miss R. C. Lee (RCL), Miss E. J. Lenton (EJL), Ministry of Agriculture, Fisheries and Food (MAFF), J. Morton (JM), W. F. Parker (WFP), Miss B. Pettit, E. W. Powell (EWP), F. H. Rawlings (FHR), J. G. Riley (JGR), S. W. H. Rolfe, T. B. Silcocks (TBS), Dr. C. E. D. Smith, G. H. Stansfield, R. J. Tucker, G. Walker, R. G. Williams (RGW), S. Willis (S.W.).

Check list numbers and names are taken from Corbet (1964).

1. HEDGEHOG. *Erinaceus europaeus*. The number of records was down by a third compared with the last three years and most animals were seen between June and September. Earliest sightings were two in January (EWP, RGS) and then only one in each of April (TBS) and May (RGS). Five were seen in December, the latest on the 25th (TBS). First young were seen on 14th July (SW).

2. MOLE. *Talpa europaea*. Generally abundant except in the City of Bristol. One golden cream specimen was caught by a cat at Stratton-on-the-Fosse (JHK). Tetley (1940) described this and other colour varieties of moles found in Somerset.

3. COMMON SHREW. *Sorex araneus*. Seventy-three skulls were found in discarded bottles, including ten in one bottle (TBS). Those found at Bleadon Hill (FHR) were first records for that area. One Flap trap at Bourton Combe contained one live specimen and the backbone and everted skin of another (ARH).

4. PYGMY SHREW. *Sorex minutus*. Two were trapped and seven skulls found in bottles. First records were obtained for Bleadon Hill and Brockley Combe (FHR). No records received from Gloucestershire.

5. WATER SHREW. *Neomys fodiens*. Nine records were received from seven 10km squares. New localities recorded were Wrington (RGS), Weston-in-Gordano (JM), Bourton Combe (ARH), Coalpit Heath (BJG) and Dursley where a male and female were trapped inside a shop (RGS). One trapped alive at Bourton Combe had prominent white ear tufts.

24. FOX. *Vulpes vulpes*. Although records involved fourteen 10km squares over 50% of sightings were made in Bristol. There were many records from the Coombe Dingle area where foxes were frequently heard calling in January (RCL), and from the Downs where one was seen feeding from a waste bin (JGR). Most sightings in the City were made between 01.00 and 06.00 hours, but others were seen at 09.00 and 10.00 near Purdown (MK) and 08.00 hrs. at Cotham (JH). Several reports of cats and other pets having been killed, probably by foxes, were received. The only record of cubs was from Clevedon (JFB) where four were reared successfully.

27. STOAT. *Mustela erminea*. Only three records were received, from West End and Nailsea Moor (HRH) and Long Ashton (RGW).

28. WEASEL. *Mustela nivalis*. Eight sightings, mostly of animals crossing roads. First record received for Olveston area (RJC).

29. POLECAT/FERRET. *Mustela putorius*. One juvenile, probably escaped from captivity was shot at Stanton Drew (PFB). Identification was confirmed by the National Museum of Wales.

30. AMERICAN MINK. *Mustela vison*. Reported on Rivers Banwell, Oldbridge, Little and Yeo, and from Blagdon Lake. A pregnant female was captured on 30th April and kits were caught between mid-June and mid-August (MAFF).

31. BADGER. *Meles meles*. New localities recorded were Bleadon Hill (EJL) and Middle Hope (HRH). One female, found dead at the roadside at Portishead (JDE) was heavily parasitised by biting lice (Mallophaga sp. undet.) and fleas (*Paraceros melis*–det. RGS).

It was found on 24th March and there were only two very small embryos in the uterus. Localities of many setts were reported but there were no sightings of cubs.

34. GREY SEAL. *Halichoerus grypus.* A pup was found on the beach at Weston-Super-Mare in November and taken to Bristol Zoo.

53. BROWN HARE. *Lepus capensis.* Recorded many times around Yatton, Congresbury, Wrington and Dundry (JMB) and at Nailsea (HRH). Single records from other areas included the first from Falfield (RGS).

55. RABBIT. *Oryctolagus cuniculus.* Small number of records from a wide area, mostly of rabbits seen alive, but presence also recorded from droppings, scrapes and holes.

57. GREY SQUIRREL. *Sciurus carolinensis.* Many observers recorded squirrels, most being seen in and around Bristol and Clevedon. One in Ashton Park was said to be tame enough to stroke (ERA).

61. HARVEST MOUSE. *Micromys minutus.* No records of sightings but a nest found amongst rushes at Wetmoor was thought to belong to this species (AFJ). Thirty three skulls were recovered from pellets from Street Heath (TBS).

62. WOOD MOUSE. *Apodemus sylvaticus.* Caught at most trap sites, 19 at Bourton Combe (ARH), and 14 (RMC) and 21 (PLG) in Leigh Woods. Skulls found in bottles at Bleadon Hill were the first records for that area (FHR).

63. YELLOW-NECKED MOUSE. *Apodemus flavicollis.* A major success of the field meetings was the trapping of four individuals at Cheddar Wood (RMC), one at Bourton Combe (ARH), two at Wetmoor (AFJ) and five at Midger Wood (AFJ, RGS). Most of these were first records for these areas.

64. HOUSE MOUSE. *Mus musculus.* Reports were all from inside buildings. Some populations in Bristol have been shown to be resistant to the anti-coagulant poison warfarin.

65. BLACK RAT. *Rattus rattus.* Confirmed specimens were recorded in Bristol from Clifton (WFP) and Kingsdown (RGS). An apparent decrease in numbers was reported from Sharpness.

66. BROWN RAT. *Rattus norvegicus.* Only a few sightings were reported with first records from Portishead and Midsomer Norton (JGR).

67. BANK VOLE. *Clethrionomys glareolus*. Nearly all records were from Somerset, 17 were trapped alive at Bourton Combe (ARH).

68. WATER VOLE. *Arvicola terrestris*. Sightings reported from Chew Valley Lake (EJL) and Littleton (FHR) and field signs from Woodford (EH) and Wick (RGS). Very few records have been received since 1965.

69. FIELD VOLE. *Microtus agrestis*. Most records were of skulls found in bottles in Somerset. Two males caught in one Longworth trap at Midger Wood fought aggressively.

Twenty two species were positively identified within the Bristol district in 1969. Some bats were recorded but identifications were not confirmed. No records of deer were received. From 1970 the survey area will be extended to include all of Gloucestershire and Somerset within the northern half of the 100km. square ST. Only a small percentage of the records received can be included in reports in *Proceedings* but all are preserved and valuable information is accumulating.

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"A DESCRIPTION OF A CLIFF . . ." [AUST CLIFF] by GÖRAN VALLERIUS

TRANSLATED BY H. D. HEDBERG & H. ISAKSSON
with introduction and geological notes
by R. Bradshaw & S. C. Matthews.

AT the end of an extended tour of Saxony, Bohemia, France and Holland in 1710, the famous Swedish mining-engineer and metallurgist Göran Vallerius (1683–1744) visited England where he studied the manufacture of optical glass and microscopes as well as visiting a number of mines.

It was on the journey from the mines of the southwest of England northwards to Derbyshire and beyond that he took advantage of a delay at the ferry at Aust (on the River Severn, between Bristol and Gloucester) to describe and sketch the strata in the cliff there. This is probably the earliest description of this section of Keuper, Rhaetic and Lias strata, so well known to Bristol geologists. It pre-dates by more than a hundred years (or eighty years if publication dates are taken) that by Buckland and Conybeare (1824), hitherto regarded as the earliest (Reynolds, 1946).

Vallerius' account, which was eventually published in 1743 in Volume IV of the *Konglige Swenska Wetenskaps Academiens Händlingar*, pp. 143–153, has been translated and is reproduced here together with explanatory notes on some of the features to which Vallerius refers. The translation has been kept as literal as possible in order to give the sense of early-eighteenth-century geological descriptions and to avoid reading modern concepts and rock names into the account.

Throughout the text Vallerius used words of foreign origin which he might have picked up on his visits to the mines and mining establishments on his European tour. Some of these are given in italics in the text after the English translation.

Vallerius' description is of considerable historical interest, when it is realised that at the time he made it, and indeed at the time he published it, geology scarcely existed as a science—it was not until 1778 that it acquired a name. Evidently, however, as a mining engineer Vallerius had gained some knowledge of stratigraphy and simple rock structure, and his account indicates that although there was no systematic teaching of geology in his day a practical interest in geological ideas existed, even in the early years of the eighteenth century.

Vallerius describes a part of Aust Cliff that has been removed by erosion at some time during the intervening two hundred and sixty years. Comparison of the sketch he made (Fig. 1) with the state of the rocks today leads one to suspect that his observations, or at least his sketches, were not wholly accurate. For example, he shows his faults as reversed, whereas they should be normal (note 8), but it is improbable that the significant difference between faults of these two types was recognised in his time. What is of particular interest is that Vallerius used an easily visible example of faulting and shattering as a means of indicating to his readers what can happen in mines when an ore-body is cut and displaced by faults or crush zones.

So far as the stratigraphical details of the section are concerned, it is not surprising that it is sometimes difficult to translate the terms he used into modern terminology. Thus gypsum (note 7 and Fig. 3) is described as sandstone, but it is most improbable Vallerius had any knowledge of the nature of gypsum, because the chemical and mineralogical characters of this substance were not recognised until many years later. He was however sufficiently observant to notice that some of the gypsum was fibrous in habit. The commentary on Vallerius' paper is contained in the notes following the translation, which begins:—

A description of a cliff consisting of several kinds of soil, stone, sand and clay, lying in layers one under the other, intended to help in the elucidation of striking veins and, in particular, of bedded-type workings; on disturbed zones and on the properties of these strata (*stratis*) or beds.

BY

GÖRAN VALLERIUS

In the autumn of 1710 I was on my way home from the mines of the western part of England, in particular those of Somersetshire, and was travelling through Gloucestershire to northern localities in Staffordshire, Derbyshire, etc. When I had passed through Bristol I was going to cross the River Severn by ferry but I arrived there at ebb tide and I had to wait for a few hours until the water first fell to its lowest ebb and then, after the turn of the tide, until it began to rise to the height at which boats or ferries could go across.

Nowhere have I seen such a great range between high and low tide and the current so violent in its ebbing and flowing as here on the River Severn. I was able to estimate by eye with reasonable certainty that the range was about 8 or 9 ells.[1]

On both sides of this river there were hillocks of soil, sand, gravel and stone but on the eastern side particularly, alongside the river, there was a highish hill, or rather a cliff or bank, estimated by eye to be 20–24 or more ells high, consisting of such kinds [of rock] as already mentioned.

The cliff was nearly vertical for a fairly good distance along the river and displayed all its kinds of material in a profile (*profil*) or section (*durchschnitt*) which without doubt must have resulted from the strong inflow and outflow of the river as it gradually cut away the foot of the cliff, consisting of clay, whereupon the upper parts fell down and were washed away by the stream. In the same way the River Dal[2], in particular, year by year and day by day cuts away its banks, which in many places consist of loose sandy earth, so that the river banks become as high, vertical and steep as they are now seen to be. Consequently this eroded and sliced-off cliff had a very beautiful and curious aspect, not unlike a painting with bands of different colours, in such attitudes as the drawing of Plate III, Fig. 1 (Fig. 1) to some degree indicates. This drawing was made freehand and by eye without any measuring.

Such strata or layers of different kinds of material are indeed not unusual. They are found in various places and commonly in mines where the ore is bedded such as at the Wettin Stenbols open-workings and especially in the Mansfeld copper mines of the Mansfeld, Eisleben and Wiederstadt[5] districts, where the ore can lie 20–30 fathoms below the surface and extend through almost all the whole region and county of Mansfeld. When one wants to search for the ore by sinking shafts, 14, 16 or 18 earthy- and sandy-type rocks are usually penetrated before the bottom (*die Sole*) and the layers of ore are reached. The same thing is found in quarries where the stones are separated from one another by layers of sand, as in the quarries (*carriererne*) at Paris outside the Faubourg St. Jacques below the Royal Observatory, and in sundry places thereabouts. Similarly such a mixture of various [rock] types is found in our alum and coal mines.

Below the above mentioned rock-clay and sand-layers there runs a blue clay [bed] (mm) and below that a reddish-brown clay layer (n) to a total thickness of about 10–12 ells. The latter was encountered again at the foot of the cliff where it was partly covered with a mixture of stones and all the earth and sand-types, previously mentioned, which had fallen down the cliff. In this blue and red-brown clay it was remarkable that you could almost see at a glance how day by day it stiffened, hardened and was petrified (*petrificerades*), so that in some places it was entirely soft and loose like ordinary clay, and elsewhere it was somewhat harder, yet crumbly,

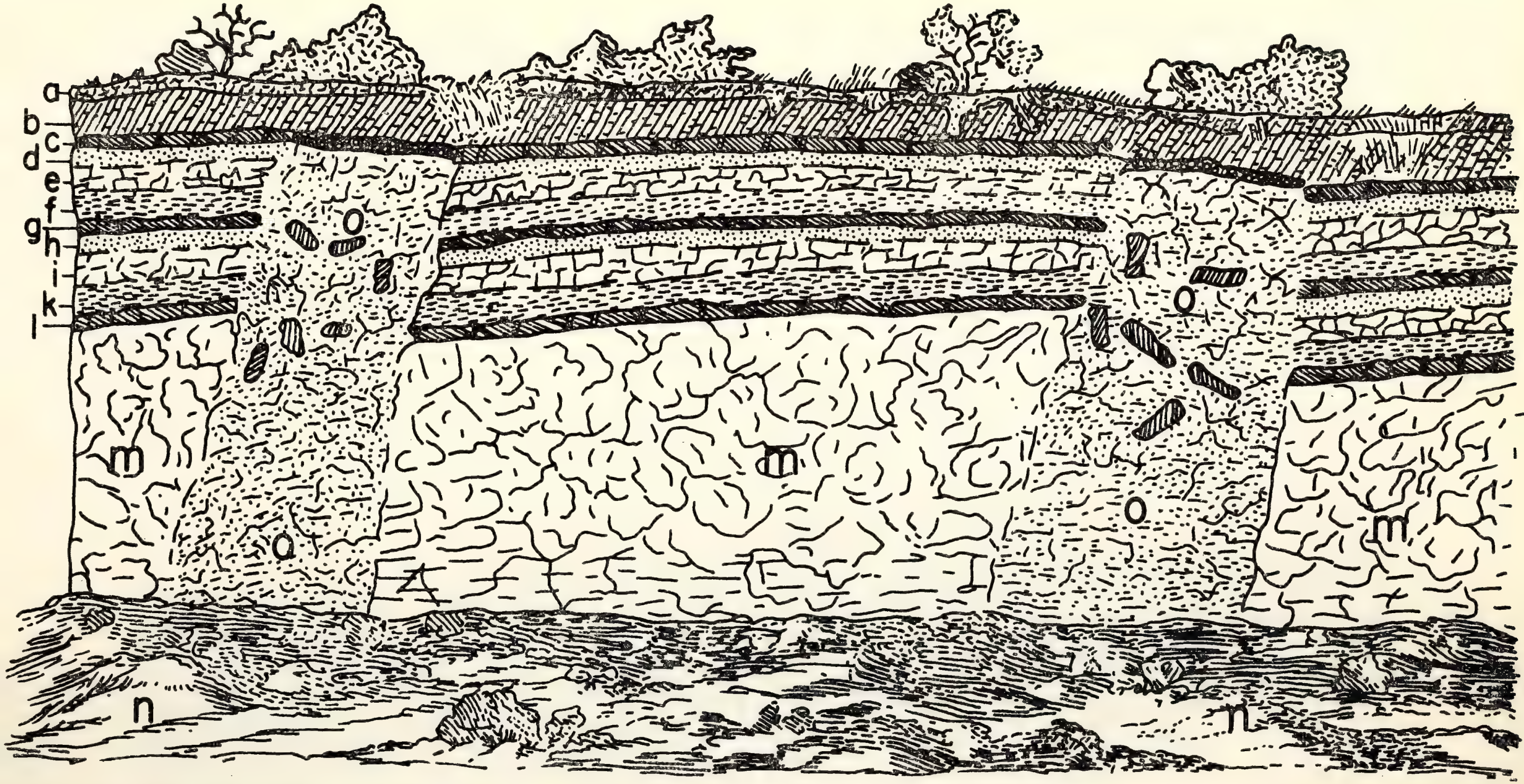
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Fig. 1. Sketch of part of Aust Cliff based on Vallerius (Tab. III, Fig. 1).

like clay lying exposed to the cold air and beginning to freeze. In contrast, in other places, it was quite hard and almost turned to stone so that with a stick or merely with one's fingers one could pick out pieces which were neither truly clay nor stone: indeed some pieces on one side consisted of soft clay but on the other side almost of stone albeit of a loose kind.

Within the cliff or hill this clay was soft and weak. But such an hardening (*induration*) had taken place mostly on the side that faced outwards and was open to the air and the play of the weather; just as happens in a similar way in the sandstone quarries (*carriererne*) of Paris, mentioned above, where the stone deep down in the quarries is so soft that it can be carved and cut with a knife, and as soon as it comes up to the surface it can very easily be sawn to any desired shape and size but it becomes hard and firm when it has lain for some time in the open air.

This blue and red-brown clay was traversed by numerous cracks or fissures, upwards, downwards and sideways, without order, over the whole of the cliff. When water from above sank into the cracks it remained standing there and gradually by degrees turned into stone. It could clearly be seen how from one day to another it was gradually formed because there were several stages of the process to be found at one time: first, the water itself completely clear; then somewhat cloudy, muddy and dirty; further like loose sand; thereafter a loose and immature friable sandstone; and finally a mature stone, white or reddish or pale red in colour, of a sandy type such as dripstone or Vinsten, tophus[6] or stalactites which are formed slowly in old caves and vaults. The previously mentioned sandstone was in the clay of the cliff and was formed in slices in the form and shape of cracks turned edge outwards with the flat sides towards the clay. It was also characterised by the fact that the veins or fibres

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a. Grassy slope, black soil or vegetable mould.

b. A stratum (*stratum*) or layer of a grey type of soil, 2, 3 or 4 ells thick.

c. A layer of dark-brown sandstone $\frac{1}{2}$ to $\frac{3}{4}$ ell thick, which was not a continuous coherent bed throughout but was made up of stones separated from one another by larger or smaller fractures. Nevertheless these were so tightly and compactly set together that a stone-mason could not better set large and small free-stones together.[3]

d. A light-grey type of sand.

e. A layer of red clay.

f. A sandy type of soil.

g. Next, a layer of stone similar to that already described.

h. Under this another light-grey type of sand.

i. A bed of red clay.

k. A sandy type of earth.

l. Again a layer of stone like that in c and g.[4]

(*fibrerne*) in the stone itself did not run parallel to the slice or crack but transverse to it, in some places thinner in some thicker, some $\frac{1}{4}''$ thick and some a knife's thickness, more or less, according to the width of the crack. Because of this it was also very fragile and loose and easy to break, just as a stick or a thick log sawn across into thin slices will have the fibres running straight through the slices and because of this become loose and fragile.[7].

These sandstone slices were much more readily indurated and turned into stone than the clay mentioned above. Because of this the clay was surrounded by slices of sandstone in such a way that where the clay was fragile it crumbled and fell out down the cliff to leave holes between the slices: which was quite beautiful to behold and not unlike a marbled wall of red and blue colour set with white veins.

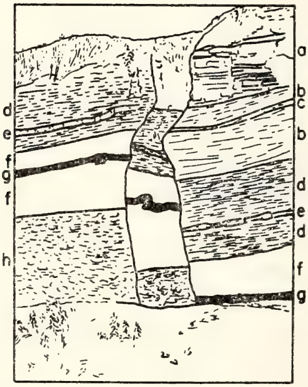

Fig. 2. Step-fault at the southern end of Aust Cliff (based on Reynolds, 1946). (for explanation see note 8).

Among the other things on the cliff it was particularly noteworthy, and this might be of use and instructive in connection with mining, that all of the soil, clay, sand and stone types [of rock] from top to bottom were abruptly cut off, sunk down or disturbed especially at the two places marked o – o and o – o (Fig. 1).[8] From a distance these looked like two columns consisting not of orderly layers such as were mentioned above, but of a mixture of all these types, without order, so that with all aspects considered it seemed as if this abrupt cutting-off had occurred either due to some subterranean opening whereby the cliff had yielded abruptly and sunk down and consequently moved the layers out of order; or else due to some water which, by forcing its way down from above, made some changes at the bottom of the cliff.

This hill, with its beds and layers can reasonably be regarded as a model or a portrayal of the true kind and character of bedded-ore workings. The rocklayers c, g and l were lying in their correct order under the earth, clay, soil and sand layers and continued well on both sides of the above mentioned cut-offs or disturbed-zones, o – o, but in such a way that they did not correspond to one another in height or depth below the surface, but at such inequality of level as the drawing shows as if they had sunk down deeper on one side. In the same way do ore-bodies behave in bedded workings in that they lie in their place either horizontal (*horizontali*) or inclined (*inclinato*) but when they are being followed by workings it is often found they are completely cut off and disappear; in which case they are sought again either by driving adits, going higher or lower, or by sinking shafts in which case the winning of the ore is difficult. And therefore many such shafts in close proximity to one another are seen throughout the whole Mansfeld district.[9]

Such cutoffs and disturbed-zones are also found in striking veins both vertical and slanting or sideways dipping; for sometimes it is found that at depth a useless and barren skölar cuts the ore-veins, which are not lost because of this, for once such a zone is broken through the ore body maintains its same strike downwards.[10].

There is a clear example of this in the well-known Dannemora[11] iron-mines, where a barren skölar, 2, 3 or 4 ells thick in some places, running from south to north and somewhat inclined, cuts off the large and thick ore-body in all the biggest and most profitable mines but after it is broken through the ore lies underneath as good as before.

The same thing is found in striking veins, in such a way that consistently a barren skölar often crosses and cuts off ore veins and of this there are many examples at Salberg and Garpenberg and in the iron mines of Norberg and Betzberg.[11] In these cases it often happens that, after the skölar has been penetrated, the ore body is lost from its correct strike and has been thrown either to the left or to the right side and must be sought again with shafts since further on it usually continues in its earlier former direction. In German mines this is called *Absetzung der Gänge* (offset of the veins).

A cheerful and careful miner should not be discouraged by these cut-offs and disturbances until he drives an adit sufficiently far to learn what is the character of the rock ahead. However we cannot construct general rules from these facts that I have given you because in different places the character and essence of mines are different and the directions and kinds of skölar veins are quite dissimilar. These skölar veins are nevertheless the best guides to the discovery of ore.

NOTES

[1] An ell is about 2 ft. (0.6m.)

[2] The River Dal, north of Uppsala in Sweden, famous for the mud-flows which occur along its valley.

[3] This refers to the well-marked jointing in one of the limestone bands near the top of the cliff. The joints are in two directions approximately at right-angles and the result is to give a saw-tooth pattern of outcrop projecting from the cliff face.

[4] It is difficult to compare in detail Vallerius' section with the present one as recorded for example by Reynolds (1946) but certain correlations can be made—see Table I below. The red clay, i, is the ironstained Westbury Shales adjacent to the Bone Bed; stone, g, may be one of the Pecten Beds and stone, c, a prominent bed in the Lias.

TABLE I

Vallerius (*Fig.* 1)		*Reynolds* (1946, *Fig.* 2).			
a	Black soil				
b	Grey soil (4–8 ft.)				
c	Dark-brown sandstone (12–18 ins.)	a	Shales and limestone		Lias
d	Light-grey sand	b	Cotham Marble Yellow clay & limestone	6″ 4′ 0″	Upper Rhaetic
e	Red clay	c	Grey limestone Yellow argillaceous limestone	2′ 4″ 4′ 0″	
f	Sandy earth	d	Greenish Black Shales		Lower Rhaetic
g	Stone similar to 'c'	e	Upper Pecten Bed Black Shales	5″ 8′ 0″	
h	Light-grey sand		Lower Pecten Bed Paper Shales	8″ 4′ 0″	
i	Red clay		Bone Bed		
k	Sandy earth	f	Tea Green Marl	3′ 0″	Keuper
l	Stone similar to 'c' and 'g'	g	Sandy bed	1′ 0″	
m	Blue clay	f	Tea Green Marl	19′ 0″	
n	Red-brown clay (20–24 ft.)	g	Red Marl	20′ 0″	

[5] Wettin, Mansfeld, Eisleben and Wiederstadt are towns in Germany to the northwest of Leipzig. The ore occurs in the *Kupferschiefer*, a cupriferous shale about 50 cm thick, containing the sulphide minerals bornite and chalcocite with minor amounts of galena, sphalerite and tetrahedrite. (see note 8).

[6] Winestone is a deposit of tartar produced during wine-making.
Tophus—a calcareous deposit from water, i.e. calcareous tufa or travertine.

[7] Vallerius is here describing the gypsum veins which now occur in the red marls about 70 ft. below the Rhaetic Bone Bed. Figure 3 (see also Whittard, 1949, Pl. XXI) shows the principal occurrences of the gypsum as nodular alabaster, coarse irregular veins, mainly vertical, and finely fibrous veins sensibly horizontal. A possible explanation for Vallerius' suggestion that 'water turns into sandstone'

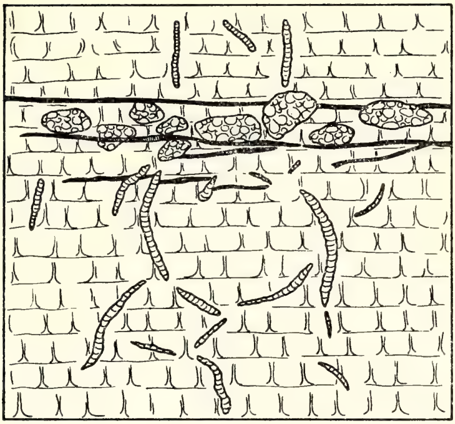

Fig. 3. Gypsum veins and nodules in the red marls. (width of section about 4 ft.)

may be that water-filled cracks in the red marls may sometime be traced downward into crevices bounded by narrow green zones where the iron had been reduced; these in their turn pass into gypsum-filled veins also with border zones of green marl.

[8] The fault zones here described and drawn in fig. 1 are now overgrown and difficult to see but they may be compared with a sketch made by Reynolds (1946, fig. 2), see fig. 2. It seems clear that Vallerius was drawing the step-faults at the southern end of the cliff but the blocks are shown disrupted to a greater extent than they are now. Furthermore the faults are shown as reversed faults hading to the north whereas at the present level of erosion they are normal faults hading to the south. The mistake in hade may be due to the obliquity of the view-compare fig. 2 and the note by Reynolds (1946, p.31).

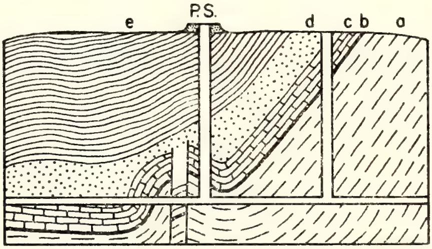

Fig. 4. Diagrammatic section across part of the Mansfeld district (based on Lindgren, 1933).
(for explanation see notes 5 and 9).

[9] Figure 4 based on Fig. 152 in Lindgren (1933) is a diagrammatic section across part of the Mansfeld district. It shows a prospecting shaft (P.S.) put down to prove the Kupferschiefer in a region which has been folded and faulted on the crest of a small anticline. The succession is:—

e	Triassic Sandstone
d	Permian gypsum and salt
c	Permian (Zechstein) marine limestone
b	Permian Kupferschiefer
a	Permian (Rothliegendes) sandstone

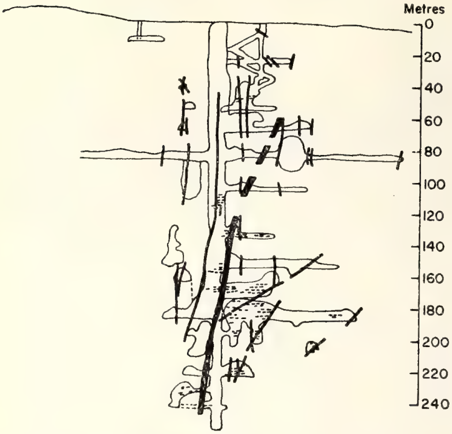

Fig. 5. Vertical section through part of the Sala Mine, Sweden (from Sjögren, 1910) (for explanation see text).

[10] These disturbed zones or skölar are common in the Swedish mining areas to the north and northwest of Stockholm. Figure 5, based on Plate 54 in Sjögren (1910), shows a vertical section through the famous Sala mine where lead, zinc and silver ores (dashes) are emplaced in rocks of Pre-Cambrian age. The skölar veins (shown in black) may be up to several metres thick and consist predominantly of talc, serpentine and chlorite and only rarely contain metalliferous minerals.

[11] The iron-ore bodies of Dannemora, Norberg and Betzberg are of magnetite emplaced in Pre-Cambrian rocks. They too are frequently cut by crush-zones or skölar consisting of talc and chlorite. Salberg is the Sala mine described above and Garpenberg has sphalerite, pyrite and magnetite emplaced in Pre-Cambrian leptites.

ACKNOWLEDGMENTS

We are grateful to Professor Hedberg for allowing us to use his translation as a basis for our own; to Miss H. Isaksson for assistance with the final draft; to Mrs. A. Gregory for drawing the figures; and to Dr. V. A. Eyles for reading the manuscript and making helpful suggestions.

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THE PROBLEMS POSED BY COLLIERY WASTE TIPS IN SOMERSET

By C. G. Down

Department of Botany, University of Bristol

(1) INTRODUCTION

This communication is intended as a brief survey of the colliery waste tips in the North Somerset Coalfield, with the object of defining the various problems of worthwhile after-use that they present, and to suggest some feasible lines of approach whereby these problems may be resolved. There are certain conditions of dereliction in common with other coalfields and, in view of the probable cessation of coal mining in Somerset within the next two years or so, it is felt that it will be of value to consider the problems and their solutions.

The Somerset Coal Measures, as seen in a complete section, fall into three main divisions, the Upper and Lower divisions containing the most important coal seams. The Middle or Pennant division in Somerset includes only one seam that has been mined in commercial quantities.

There are four distinct geographical areas in which coal has been mined:—

(1) Pensford—including the Stanton Drew and Bishop Sutton areas.

(2) The Cam Valley—including the Clutton area pits and those east of Clutton, as far as Dunkerton.

(3) The Somer Valley—including all pits east of Farrington Gurney, and as far south as Kilmersdon.

(4) The Mendips—all the pits lying in the arc between Moorewood on the west and Mells on the east plus those as far north as Downside.

The earliest coal mines in Somerset were those working the outcrops of the Lower Coal Measures in the Stratton–Holcombe–Coleford area, and those at the outcrop of the Farrington Series in the Clutton area, which date back to the 1400's. It was not until 1763, with the sinking of Old Pit at Radstock, that the modern era of coal mining began, and it is only pits belonging to this period that need concern us here. These include a number of the largest

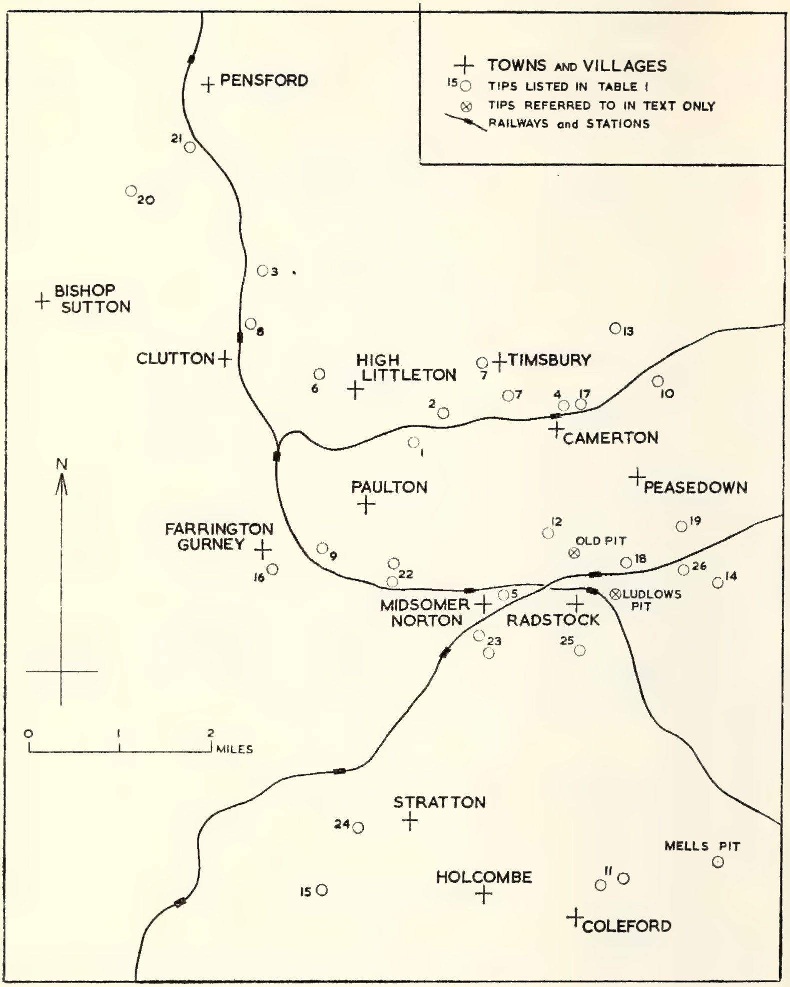
TOWNS AND VILLAGES
15 TIPS LISTED IN TABLE I
TIPS REFERRED TO IN TEXT ONLY
RAILWAYS and STATIONS
PENSFORD
21
20
3
BISHOP SUTTON
8
CLUTTON
HIGH LITTLETON
6
7
TIMSBURY
13
7
4
17
10
2
CAMERTON
1
PEASEDOWN
N
PAULTON
FARRINGTON GURNEY
16
9
22
12
OLD PIT
19
18
26
14
LUDLOWS PIT
5
MIDSOMER NORTON
RADSTOCK
23
25
0
1
2
MILES
STRATTON
24
MELLS PIT
11
HOLCOMBE
15
COLEFORD

TABLE I

1	Paulton Engine	c. 1868
2	Withy Mills	c. 1870
3	Fry's Bottom	1895
4	Camerton Old Pit	c. 1900
5	Old Welton	c. 1905
6	Greyfield	1911
7	Upper and Lower Conygre	1916
8	Clutton (Burchells)	1921
9	Farrington	1921
10	Dunkerton	1924
11	Newbury and Mackintosh	1927
12	Clandown	1929
13	Priston	1930
14	Foxcote	1931
15	Moorewood	1932
16	Marsh Lane	1949
17	Camerton New Pit	1950
18	Radstock (Tyning)*	1954
19	Braysdown	1956
20	Bromley	1957
21	Pensford	1958
22	Old Mills & Springfield	1966
23	Norton Hill	1966
24	New Rock	1968
25	Kilmersdon	still at work
26	Lower Writhlington	

*Tyning Colliery closed in 1909 but the tip was used by Ludlows Pit until closure in 1954.

collieries which were all sunk in the period when there was more certainty and less speculation about the results of putting down shafts.

The tips with which this paper is concerned are all products of mining in the Upper Division with the exception of New Rock, this colliery giving its name to one of the series of the Lower Division coal seams.

Figure 1 shows the locations and closure dates of the major colliery tips in Somerset, including those with which this paper is primarily concerned. Reference to figure 1 shows that there is not an even spread of closure dates over the last 100 years, nearly half of the colliery tips listed having closed since the industry was nationalised in 1947.

(2) THE PROBLEM

All these post–1947 tips can be classed as derelict land, which can be defined as "land so damaged by industrial use as to be incapable of further use without treatment" (Ranwell, 1967). Two categories of nuisance can be recognised as being produced by these tips:—

(a) Nuisance due to loss of visual amenity; dust blowing from the tips; industrial "scars" which may tend to discourage new developers in the areas concerned.

(b) Actual damage and danger to property, and the danger to lives (especially those of young children) created by the tips.

Considering the first category, little nuisance is caused by tips closed prior to 1947. All have a significant vegetation cover of herbs, shrubs and small trees and do not therefore intrude on the landscape. It would, however, be helpful in some cases to increase the vegetation cover by herb sowing and limited tree planting, especially around the perimeters of these tips. Many of the early tips are small, and even the largest, that at Dunkerton, bears sufficient vegetation to render it indistinguishable from the general scene. Some tips dating back to the 1860's are so grassed over as to merge completely with the surrounding fields and, indeed, they form good rough grazing areas. The post–1947 tips present the worst problem, especially those closed since 1954. On some of these there is very little vegetation cover and they are obvious eyesores.

Considering the second category of nuisance, the post-1954 tips are the worst. Since the disaster at Aberfan in South Wales, tip precautions have been tightened-up by the National Coal Board and there seems little danger of a repetition on even a small scale. However, slippages have occurred in the past and there is in some cases persistent downwash and drainage from the tip which submerges small areas of adjacent fields in slurry. A number of tips also present a possible hazard to children playing on them, having some very precipitous slopes. This danger, to a very slight extent, is present on most of the larger tips, regardless of their age.

(3) POSSIBLE SOLUTIONS

There are two lines of approach, which are best applied together, whereby the various nuisances created by these tips can be eliminated or greatly reduced. One is to regrade the tip, lowering its height and lessening the slopes; the other is to solve the problem by an established biological technique and carry out a systematic planting programme. These two methods when used together have the advantages of increasing the safety of the tip, allowing some form of constructive after-use of it, and improving the visual aspect of the area concerned.

The regrading method has been successfully used when the tip has been systematically bulldozed away and used to cover the site of the colliery. Thus, the height and prominence of the tip is lessened and a new and level site made available although this method is only applicable in cases where there is derelict land, such as the colliery site, over which the spoil can be spread.

Another point to be mentioned here is the removal of burnt tip material for use as motorway foundation. In tips where the spoil is suitable for this, the removal results in a great reduction in the tip's bulk and, if the remaining material is spread out and relevelled, the result can be excellent. Properly carried out, such removal proves to be advantageous for all concerned, be they contractor or nearby residents.

The second method of amelioration is that of planting herbs, trees or shrubs, according to the use subsequently envisaged. The shales of the Somerset tips are, when tipped, quite strongly alkaline (pH 8·4—pH 9). Weathering brings this figure to approximate neutrality, while further exposure gradually reduces it to a minimum level at the surface of about pH 4·8 (Hall, 1957). This is in marked contrast to the Midland and North of England coalfields, where the shale often weathers to give a persistent acid leachate of about pH 3·5 or, in some cases, much lower. In these conditions, the establishment of vegetation by natural means is a lengthy process, 80 years being sometimes insufficient to get an acceptable cover. Somerset therefore is fortunate in this respect because, after about 10–15 years of disuse, tips possess a vegetation cover which, at least in the summer, is quite adequate to hide them from undue notice. Trees, notably *Quercus robus* and *Pinus sylvestris*, are early colonisers although the growth form of the oaks in particular is often stunted and bushy. Good examples of this, in trees of 15–20 years of age, can be seen on the Bromley tip. However, 15 years is clearly too lengthy a time to wait before a good plant cover is established and artificial planting therefore could be applied in Somerset to great effect.

The disadvantage of tree planting is that the tip area is thus sterilized from the point of view of any practical after-use, while in Somerset the areas involved are too small for economic forestry schemes. In the Forest of Dean though, colliery tips have been planted by the Forestry Commission as part of schemes covering larger areas than just the tips themselves. It remains to be seen whether the felling of the trees will be detrimental to the tips though this is unlikely if replanting is carried out fairly soon after felling. Sowing of a grass sward has not been attempted in Somerset, but good results have been obtained between 1965–68 by the Nottinghamshire County Council (N.C.C. 1968) who's work in this sphere has been coupled with a regrading of tip surfaces. Satisfactory results have so far been obtained by sowing S23 Perennial Ryegrass, which can be sown directly on to the graded soil, but to avoid problems of reversion, it has been found better to cover the tip with 6″ of topsoil prior to sowing. The trials are continuing but it seems likely that this method will provide the best overall results. Already, sufficient areas of grassland have been obtained on spoil 5 years old to allow sheep to be grazed and the grass to be mown for hay, although the local farmers have tended to be somewhat prejudiced against the new areas of farmland so produced. An advantage is that some after-use can be obtained from the tip, and there seems little reason why a combination of grass seeding and "copse" planting should not produce an area which is both suitable and pleasant for public recreation.

CONCLUSIONS

This survey has shown that there is a problem, albeit a limited one, to overcome in Somerset and some specific suggestions can now be made. There are two possible courses of action. One is to regrade the tips for such uses as factory sites or playing fields, in conjunction with a limited amount of tree planting in the form of shelter belts. On the other hand, if the site limitations preclude any great levelling of the tip, either complete or partial afforestation, the latter in conjunction with grass seeding to provide public open space should provide the best solution.

ACKNOWLEDGMENTS

I wish to thank Dr. M. H. Martin for his helpful comments on this paper, and the Fry Fund of the University of Bristol for financial assistance with the plates.

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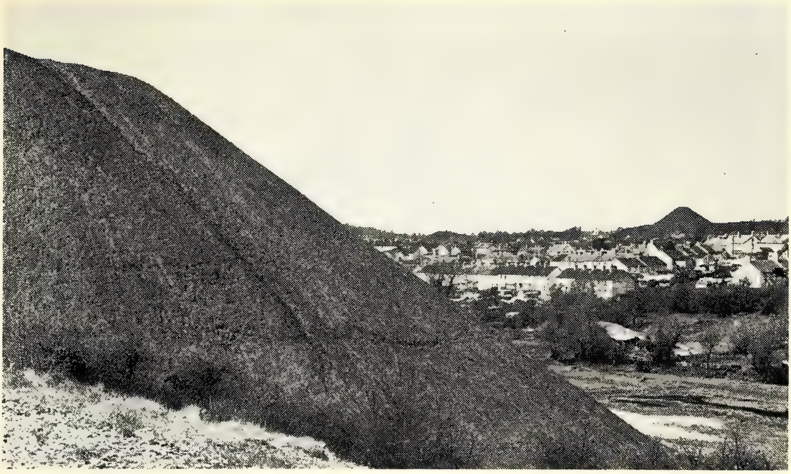
Book Review

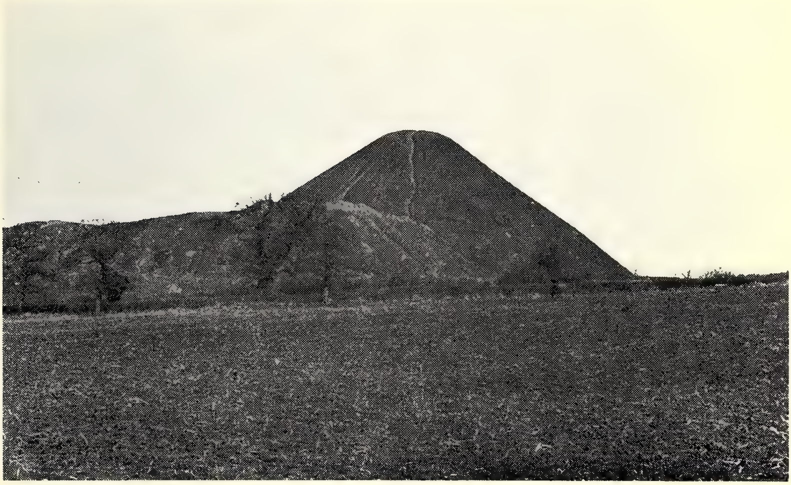
Geological Highlights of the West Country, by W. A. Macfadyen, 296 pp., 26 textfigures, Butterworths & Co. (Publishers) Ltd., London, 1970. Price £3.

This first Nature Conservancy Handbook has been written by a former Chief Geologist of the Nature Conservancy. Ninety 'Sites of Special Scientific Interest,' including quarry sections, cliffs and caves, are described mainly with reference to published literature. The Sites are arranged by County: Cornwall, Devon, Dorset, Gloucestershire and Somerset. For each Site information is given on the National Grid Reference, Ordnance and Geological Survey map numbers, the field of geological interest, and references to the relevant publications. The descriptions are good and contain most of the published information carefully assembled to give a comprehensive picture. The twenty-six textfigures include general locality maps, generalised geological sections and some poorly printed photographs. The book could be criticised for not aiding the reader to locate the Sites beyond giving the Grid Reference and for not having a sufficient number of sketch maps and detailed sections of particular localities; it contains, however, a wealth of information attractively presented and very clearly described. It will prove of great use to any geologist, amateur or professional, who wishes to learn more about the geology of the south west. At £3 it is excellent value for money.

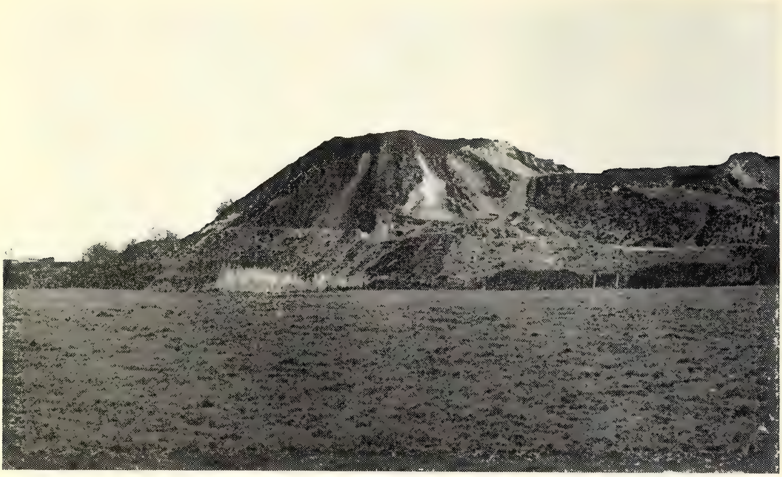
J. W. Murray



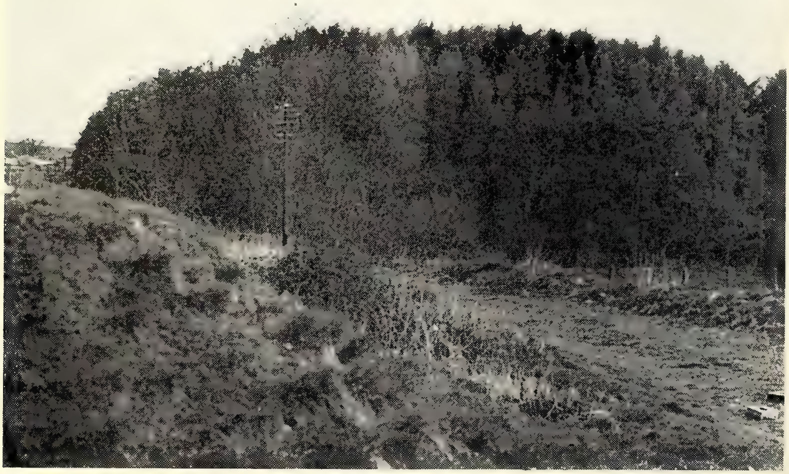
Midsomer Norton is dominated by the bare slopes of two recently-closed tips: Norton Hill in the foreground and Old Mills on the skyline.



Old Mills tip: because of the high conical shape of this tip, down wash gullies are prominent features.



Because of uncontrolled removal of the spoil, Farrington tip has lost much of its vegetation cover and is now an objectionable feature of the landscape.



Since closure in 1921, the Clutton Colliery tip has been planted with a variety of conifers and has become an asset to the countryside.

SECTION OF LIAS BELOW THE MIDFORD SAND AT BITTON HILL, BITTON, GLOUCESTERSHIRE

By T. R. Fry

a. Introduction and General Remarks

Bitton Hill lies immediately north-west of Bitton. It forms the terminal slope of a low ridge which runs northward for 2½ miles. The ridge has a capping of basal Lower Lias, except at Bitton Hill, where the Bitton Fault with a down throw of about 200 ft. has brought in higher beds of the Lias including the Midford Sand.

The sand has been quarried at Bitton Hill for many generations. It has especial properties which render it very suitable for use in the moulding of fine metal castings. It had become obvious to the writer from finds upon the slopes of the hill, that there there were earlier beds of the Upper Lias present below the Midford Sand, and also some Middle Lias. In order to ascertain the nature and thickness of these deposits permission was obtained to dig a small shaft below the floor of the main sand pit. This is sited at the side of the eastern half of Ryedown Lane opposite the entrance to Hill Farm (Nat. Grid. Ref. ST 680702). The excavation was commenced in 1950 and was continued during the following two years. A highly condensed deposit of ferruginous limestone was exposed. The rich ammonite fauna indicates a Toarcian and Upper Pliensbachian age. Because the deposits are so thin some of the zones are inseparable but careful collecting of specimens *in situ* has helped to establish some stratigraphic order.

A series of the specimens listed in this paper have been placed in the care of The City Museum, Bristol. A smaller series, including some finds made by the writer on the slopes at Bitton Hill during previous years are in the University of Bristol Geological Museum collections. These include some brachiopods and lamellibranchs not listed in the present paper.

b. STRATIGRAPHICAL SEQUENCE AND LITHOLOGY EXPOSED IN THE SAND PIT AND THE EXCAVATION.

Zone or other horizon	*Bed*		*ft.*	*ins.*
Midford Sand (representing the *Dumortieria* and possibly *Dispansum* Zones)	1	Extremely fine-grained yellowish sand, slightly compacted, with firm calcareous beds and nodular lumps in places (already exposed in the sand pit).	40	0
Thouarsense Zone	2	Soft sandy ferruginous limestone with many ammonites and belemnites		9
Thouarsense and *Variabilis* Zone fossils were found mixed in this bed	3	Rather soft, speckled brownish ferruginous limestone, with irregular layer of greasy clay at the base	1	9
Bifrons, *Falcifer* and *Tenuicostatum* Zone fossils were found mixed in this bed	4	Massive bed of iron-shot limestone with well preserved ammonites, along with rolled fragments, heavily coated with limonite. Small rolled lumps of compact grey limestone near the base	1	7
Falcifer Zone	5	Irregular layer of purplish clay ..	—	5
		Compact grey limestone with purplish speckled patches	1	1
		Irregular layer of purplish clay ..	—	1½
Margaritatus Zone "marlstone"	6	Brown shelly limestone becoming more sandy and less shelly toward its base	3	1
? Pliensbachian	7	Brownish sandy clay to base of excavation (no fossils were found) ..	1	0

c. FAUNAL LIST

Identification and remarks	*Bed*	*Depth or position*
Hammatoceras cappucinum S. Buckman	1	about middle
Pseudogrammoceras struckmanni (Denkmann)	2	both forms range from top, to about 11″ down into Bed 3
Pseudogrammoceras subfallaciosum S. Buckman	2	
Pseudogrammoceras expeditum S. Buckman	2	near the top
Grammoceras striatulum (J. de C. Sowerby)	2	also found in Bed 3 and extreme top of Bed 4
Pseudogrammoceras cf *saemanni* (Dumortier)	3	near the base
Pseudogrammoceras regale S. Buckman	3	Lower half along with G. *striatulum*
Pseudogrammoceras bingmanni (Denkman)	3	near the tops
Haugia inaequam S. Buckman	3	at the base
Haugia variabilis (d'Orbigny)	3	near the base
Haugia fasigera S. Buckman	3	near the base
Grammoceras audax S. Buckman	3	at the base
Indentification and remarks	*Bed*	*Depth or position*
Grammoceras sp.	3	at the base
(Close to *G. tirolenis* (Von Hauer), but thinner)	3	near the base
Alcolytoceras cf *germainei* (d'Orbigny)	3	
Pseudogrammoceras muelleri (Denkmann)	4	near the top
Haugia eseri (Oppel)	4	12″ to 14″ below top.
Haugia illustris (Denkmann)	4	about 4″ down
Denkmannia tumefacta S. Buckman	4	near the top
Polyplectus discoides (Zieten)	4	
Hildoceras bifrons (Bruguière)	4	
Hildoceras walcotti (J. Sowerby)	4	
Hildoceras hildense (Young & Bird)	4	middle part
Harpoceras falcifier (J. Sowerby) (specimens coated with iron oxide)	4	middle part
Harpoceras mulgravium (Young & Bird) (specimens coated with iron oxide)	4	
Peridactylites consimilis S. Buckman	4	
Zugodactylites braunianus (d'Orbigny)	4	
Dactylioceras semicelatum (Simpson)	4	
Dactylioceras commune (J. Sowerby)	4	at the base
Catacoeloceras crassoides (Simpson)	4	at the base
Brodeia juncta S. Buckman	4	4″ below top
Pseudolioceras (near) whitbyense S. Buckman	4	upper 6″
Pseudolioceras lythense (Young & Bird)	4	
Harpoceras falcifer (J. Sowerby) (in a pinkish grey limestone matrix)	5	
Harpoceras mulgravium (Young & Bird)	5	
Amaltheus englehardti (d'Orbigny)	6	extreme top
Amaltheus margaritatus de Montfort (collected from surface 220 yds. to N.W. of excavation)		

In addition to the ammonites listed above the following specimens were found:

	Bed
Nautilus terebratus (Thiolliere)	4
Gryphaea cymbium Lamarck	6
Pseudopecten aequivalvis (J. Sowerby)	6
Belemnites spp.	1, 2, 3, 5
Brachiopoda ind.	2, 3

ACKNOWLEDGMENT

My thanks are due to Messrs. Blakey & Co. of Sheffield for permission to make the excavation.

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CHEDDAR GORGE SURVEY

INTRODUCTION

THE Conservation Committee of the Bristol Naturalists' Society, under the chairmanship of Dr. L. C. Frost, set up eight working parties in 1965 to carry out surveys of local areas of great scientific importance. The aim was to make available a file of information on the value of these areas, which could immediately be quoted to the authorities concerned should any threat to Conservation arise.

The Cheddar Gorge area was defined as follows. The eastern and western limits were taken at two points on the road B3135, namely from Nat. Grid. ref. ST 490536 in the village to Nat. Grid. ref. ST 460536 near the entrance to Wellington Farm. The northern and southern limits extend up from the road on the two sides of the gorge to about a quarter of a mile beyond the top of the cliffs.

The Cheddar group worked in the field during the period Autumn 1965 to Spring 1967, after which the findings of the various sub-sections were submitted to the appropriate University departments for criticism or amendment. The Report was put together in 1968 and filed for reference. During 1969 the Conservation Committee suggested that this extract from one of the Reports on the eight areas studied in this way should be published in the Proceedings.

M. H. ROGERS
(Convener of the Cheddar group).

THE GEOLOGY OF CHEDDAR GORGE

By T. Harrison

The gorge is situated on the southern slope of the Mendip anticlinical region in the eroded Carboniferous Limestone Series. Approaching from the south, one crosses a fairly broad plain floored with Quaternary deposits and underlain by Dolomitic Conglomerate of Keuper age. The limestone uplands rise above the plain with dramatic effect.

The Dolomitic Conglomerate (fig. 1) is present at the surface in places to the east of, and within, the village, but is mainly overlain by Head to the west. Much of the Head (which is probably due to solifluction during the Pleistocene) is composed of Old Red Sandstone debris, suggesting that the gorge acted as a channel bringing the O.R.S. material from the core of the Blackdown anticline to the north.

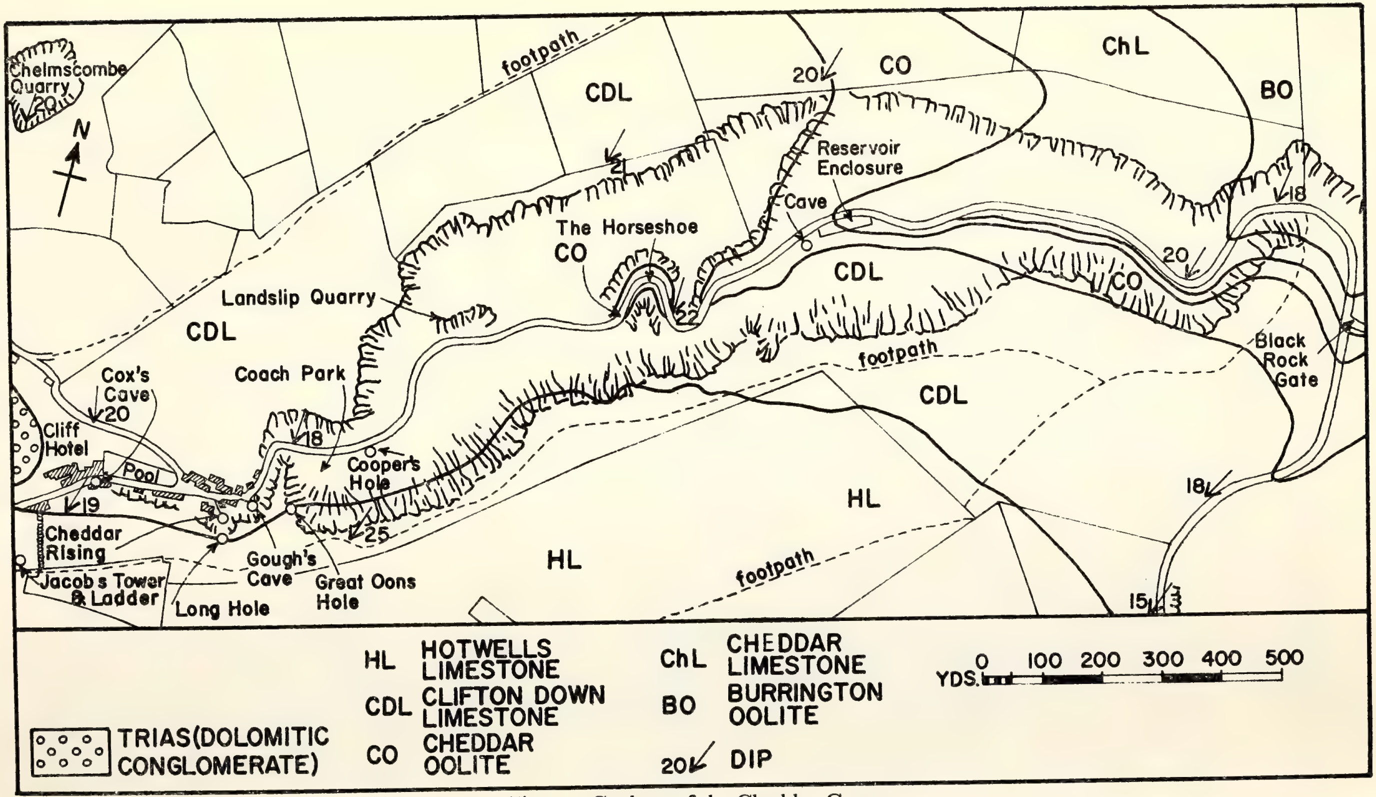
Chelmscombe Quarry
20
N
footpath
CDL
20
CO
ChL
BO
2
Reservoir Enclosure
Cave
The Horseshoe
CO
18
20
CDL
CO
Landslip Quarry
22
CDL
footpath
Black Rock Gate
Cox's Cave
20
Coach Park
CDL
Cliff Hotel
18
Cooper's Hole
Pool
19
HL
18
Cheddar Rising
25
Gough's Cave
Great Oons Hole
HL
footpath
Jacob's Tower & Ladder
Long Hole
15
3
TRIAS (DOLOMITIC CONGLOMERATE)
HL HOTWELLS LIMESTONE
CDL CLIFTON DOWN LIMESTONE
CO CHEDDAR OOLITE
ChL CHEDDAR LIMESTONE
BO BURRINGTON OOLITE
20 DIP
YDS. 0 100 200 300 400 500

Fig. 1. Geology of the Cheddar Gorge

The Dolomitic Conglomerate is the product of sub-aerial erosion of the limestone landscape in Triassic times. The limestone fragments vary in size from that of a sugar cube to a large boulder, the smaller range being largely sub-angular.

At the close of the Carboniferous, when 10,000 feet of sediments had been deposited, the Armorican earth movements took place, producing folding and faulting into a tectonic belt which extends right across Europe. The Mendip complex, formed into hills soon after this episode, still presents a very considerable feature some 250 million years later.

ORIGIN OF THE GORGE

The gorge can be interpreted as being the result of sub-aerial erosion, but it has also been suggested that it is the product of the collapse of a series of solution caves, and controversy has continued for a century. The cave theory seems to have been first propounded by Dawkins in 1862, and vigorously revived in 1947 by Stride and Stride. It would seem, however, that the sub-aerial theory must be partly true, for the upper gorge with its meandering tributary valleys and interlocking spurs is typically that of a young sub-aerial stream. According to Reynolds it dates from the Pleistocene when, due to periglacial conditions, water could not escape below ground.

The catchment was (and is) large in comparison with neighbouring streams, and Reynolds suggests that erosion was rapid, indeed it must have been, for the complete succession of the Lower Pleistocene was found in Cox's cave. The distribution and character of the Head already mentioned emphasises this point.

The alignment of the gorge appears to follow the joints; this seems evident from its shape when seen in plan. The soil is rather poor, of a greyish colour, and very shallow, only a few inches deep on average, but accumulating to some depth in hollows and fissures. The writer has not found any conclusive evidence of mineral veins within the boundaries of the survey.

GEOLOGICAL SECTION IN THE GORGE

The gorge is cut in the Carboniferous Limestone Series, and provides a very fine section; the writer has closely followed Green and Welch (1965) in the following succession:—

Hotwells Group	Hotwells Limestone
Clifton Down Group	Clifton Down Limestone
	Cheddar Oolite
	Cheddar Limestone
Black Rock Group	Black Rock Limestone

The dip is 20° approximately to the south.

Ascending the gorge from the village we pass from the Head, covering Dolomitic Conglomerate, immediately into the magnificence of the gorge here excavated in Clifton Down Limestone, a dark grey to black calcite mudstone with shaly partings, fairly well exposed on the right in the cliffs from which the River Cheddar rises. The base of the Hotwells limestone, which roofs Long Hole above, is sharply marked; in the main this formation is a massive grey crinoidal limestone with interbedded finer-grained and darker limestone, occasionally with cherty lumps. Green & Welch give the thickness as 120 feet.

In the cliff above the Gough's Cave coach-park the Clifton Down Limestone is well developed in grey to dark grey splintery limestone, while in the "Landslip" quarry, above and opposite, the cherty basal beds can be located.

Ascending the gorge and passing downwards in the succession at the Horseshoe, the Cheddar Oolite comes in low down, and is visible for all the "U" of the bend; the ooliths can be seen only with a hand lens. The bulk of the cliffs are in Clifton Down Limestone; its junction with the oolite is fairly clear as it is a dark calcite mudstone. Due to the northern swing of the gorge the Cheddar oolite comes in again at the entrance to the Horseshoe; it is typically light grey with fairly abundant fossils.

About a third of the way up the reservoir enclosure (the cliffs on the scarp side are still very precipitous) is found a very dark calcite mudstone, the base of the Cheddar Limestone. Above this most of the formation is a grey to light grey rather granular crinoidal limestone; about 200 yards above the reservoir enclosure there is a good fossil horizon with corals and brachiopods.

Entering the long "U" of Black Rock Gate, the cliff on the left is formed in Burrington Oolite, another unit of the Clifton Down Group.

CAVES

By P. F. Bird

Gough's Cave (a show cave), Gough's Old Cave and Long Hole are all part of one system of caves. Saye's Hole and the Great Rising (Cheddar Rising) almost certainly connect with it underwater. Cooper's Hole is believed to be part of the same system, but only further digging will prove or disprove this. Further extensions to the whole system, which is of great spelaeological interest, will probably be discovered by digging or by underwater exploration. Gough's Cave has yielded the most important Palaeolithic objects in the British Isles.

Gough's Old Cave and Long Hole are the haunts of a large number of Greater Horseshoe Bats and some Lesser Horseshoe Bats. Two moths, the Herald and the Tissue, hibernate there in large numbers. The archaeological deposits in Gough's, Gough's Old and Long Hole have been removed. The stalactite formations in Gough's are very good.

GREAT OON'S HOLE is a winter haunt of Lesser Horseshoe Bats.

COX'S CAVE has good stalactites and stalagmites.

ARCHAEOLOGY

BY M. DENNISON

A study of the geological formation of the area has shown how suitable for human habitation and refuge it has been since the caves in the limestone were formed.

In the course of the discovery of the caves, including those now open to the public, and of the casual exploration by pot-holers and the more systematic research by archaeologists, much important evidence has been unearthed as to the early date at which man is known to have inhabited this area of the British Isles.

There is now, in the British Museum (Natural History), the skull of the Upper Palaeolithic Cheddar Man—a British representative of Cro-Magnon man living *c.* 15,000 years ago. Bones of Palaeolithic man have been discovered in Gough's Cave, Soldier's Hole, of Neolithic man in the latter cave and in Chelm's Combe; this last also contained later remains and further unidentified bones have been removed from Bone Hole.

It should be added that Gough's Cave is one of the most important Palaeolithic sites in the British Isles.

Briefly, the other caves which have yielded important evidence are the Long Hole or Roman Cave, Cooper's Hole, Great Oon's Hole, Priddy Hole, Sow's and Pig's Holes and the Sun Hole. The fissure behind Sugarloaf Rock has produced no implements, but evidence of animals of the Pleistocene era. The recent habitation (19th cent.) of Pride Evans' Hole makes any discoveries made there suspect, and none has been authenticated.

In Gough's Cave, besides the bones of Neolithic man—thought to be so solely because of the implements found close by—have been found tools of a domestic nature. There are no arrowheads or spears, though there is a baton or shaft-straightener, but chiefly scrapers and awls. The teeth of a fox drilled for ornament were also discovered. From later habitation comes pre-Roman burnished pottery, but the cave was unknown to the Romano-British, being too near the valley floor and open to enemies.

Close by, however, the Long Hole cannot have been anything but a shelter in time of war. The talus below the cave has yielded gold and silver coins of as late as 391 A.D., and bronze and brass of the later emperors. There was, in fact, hardly any pottery made without the wheel. The connection between the cave and the (probably) important Roman house in the churchyard area of the village is interesting: coins dating from unsettled periods are found in the cave to the exclusion of those of more peaceful times, which in turn are found almost exclusively in the village.

To return to further examples of the earlier period of the Gorge's history—in Soldier's Hole there are four distinct layers of habitation: Solutrean; Magdalenian, containing bone discs; a layer containing mammal remains including those of an extinct hare; and the most recent Neolithic (axe and domestic jars and vessels) overlaid thinly by Romano-British sherds.

Chelm's Combe is perhaps of the greatest interest. Its lower layer, dating from the "reindeer period", includes the remains of a little auk, the third layer is Neolithic, the second contains pottery and a smelting furnace of the Early Iron Age or earlier, and the top layer is Romano-British, from which a bronze fibula has been taken. Four skulls and other remains have been found including the skull of a Neolithic man bearing evidence of a violent death, and that of a girl aged 6–7. This shelter was, perhaps, the richest in remains of all the subsidiary sites.

The caves were inhabited almost continuously until the end of the Romano-British period, when slightly more settled times ensued and these people were the last of the line of refugees fleeing westward from successive invasions of the east coast.

These sites have been fully excavated, the last two within the last ten years; unless, therefore, a hitherto unknown cave is discovered, the area is of interest to the archaeologist only as a site of past discoveries, for the purposes of cross-checking and reconstruction.

Appended is a list of those species of mammal which occur fairly frequently in this area during the pre-historic eras.

PRE-HISTORIC MAMMALS:

(Occurring in at least three caves)

Arctic fox, Common fox, Horse, Red deer, Reindeer, Cave pika, English varying hare, Brown bear, Wolf, Bison, Celtic ox, Irish elk, Wild boar, Great deer, Hensel's banded lemming, Extinct English vole.

(Occurring in three caves or less frequently)

Wild cat, Beaver (jaw-bone–once only), Polecat, Field vole, Continental field vole, Abbot's water vole, Mammoth (very little).

SOME BIRDS FOUND IN LOWER LEVELS

Little auk, Peregrine, Whooper swan, Mute swan, Pochard, Stock dove, Ptarmigan, Mistle thrush.

SOME BIRDS FOUND IN UPPER LEVELS

Blackbird, Short-eared owl, Mallard.

This is by no means an exhaustive list, but gives an idea of the variety of habitat which has prevailed in this important area since the earliest times.

THE FOREST OF MENDIP

BY C. E. D. SMITH

The history of the Cheddar Gorge area from the tenth to the fourteenth Century was the history of the Forest of Mendip, for Cheddar formed its heart. The term 'forest' here does not have the same meaning as it has to-day; it was a tract of land in which a distinct body of law was enforced, aimed at the conservation of certain trees (for building churches and ships) and of certain wild animals, mainly for the purpose of hunting.

It was a famous summer hunting resort of the Saxon kings and, in one celebrated hunt in the tenth Century, King Edmund chased a stag over the cliffs of Cheddar Gorge and only just escaped following it to its death.

The Norman kings were also keen hunters in the Forest of Mendip and until nearly the end of the thirteenth Century both the felling of trees and the hunting of wild animals were carefully controlled. In 1235 the king granted a licence to the Bishop of Bath to mine for lead and iron in the area, and about forty acres of wood were allotted for the smelting of the ore. At this time, however, the forest was much frequented by poachers, even including monks from the nearby Carthusian Priory at Witham, who hunted the wild animals with the help of mastiffs.

In the 1270's there were disputes between the Bishop of Bath and Wells and the king over who had the rights to hunt and fell trees; and at times during the rest of this century the area subject to Forest Law increased or decreased depending on the relative power of the king and of the neighbouring land owners. The perambulations of the Forest to fix its bounds were probably insisted on by the neighbours to prevent the king from extending his area. All forest areas outside the bounds—which included mainly the present parishes of Axbridge and Cheddar—were ordered to be disafforested. This was because they were found to have been afforested only after the coronation of Henry II in 1155.

Apart from stag, the main animals hunted were fox, hare, badger and cat. The trees that were so carefully conserved were mainly oak.

In 1337 the whole area was ordered to be disafforested by royal decree because trespassing and poaching had become uncontrolled, and by 1540 the deer and most of the trees had gone. In 1790 Collinson recorded that "since its disafforestation it has degenerated into a wild and woodless plain, retaining no longer the dignity of its pristine title, nor generally known but by the name of Mendip Hills."

THE BIRDS OF CHEDDAR GORGE

By C. Graham (*Leader of Group*)

Method. The six-inch O.S. map of the area was divided into habitat areas numbered and lettered for reference, and a copy given to each member of the team, together with a copy of a checklist of the birds known or thought to be in the district (excluding extreme rarities). This list was based on the following references:

(*a*) S. Lewis, *The Breeding Birds of Somerset and their Eggs*, 1952—a record of breeding from about 1900–1947;

(*b*) *Proc. B.N.S.*, 1947–1964, and some earlier numbers where relevant—in particular, the annual Bristol Bird Reports and H. H. Davis' *Check List of the Birds of the Bristol District* (1947);

(*c*) *Reports on Somerset Birds*, Som. Arch. and N.H.S. Ornithological Section.

Note: Since this survey was completed *The Birds of Somerset* by E. M. Palmer and D. K. Ballance (Longmans 1968) has been published.

Visits. Each area was covered by several visits in autumn, early spring and early summer. Most areas were visited in winter, except in very cold or wet weather.

Habitats. The area was divided as follows:

(1) The Gorge itself.
    (a) Steep rock and cliff face with rough herbage.
    (b) Scree with thin cover.
    (c) Hazel and mixed limestone scrub.

(2) The upland plateau above the gorge on either side.
  (a) Rough grazing, mainly grass and bracken.
  (b) Scrubby pasture with well grown hawthorn in parts.
  (c) Steeply sloping wooded areas, both natural (well-grown scrub) and planted (deciduous or coniferous) with much undergrowth forming thickets. This category includes any wooded slopes of the Gorge, mainly at the upper end.

Summary of Results

Sixty different species were identified. The area covered just excludes three interesting species; *Buzzard*, seen and heard in the Mascall wood area; *Nightingale*, heard in the Cheddar Hall Estate, and *Collared Dove*, seen and heard in the village near the bus stop.

The resident birds were generally distributed, but especially abundant in suitable habitats. In autumn the *Wood Pigeon* was very common in the wooded areas; the breeding population was most abundant (perhaps 2 pairs per acre) where there was mixed scrub woodland and in tall hawthorns, especially in the secluded N.W. part. *Carrion Crows* were observed flying in all areas; single birds were feeding on the upland, and nests were found in woods with the highest canopy. Though the rookery was outside the prescribed area, flocks of *Rooks* were seen in flight, and feeding on upland pastures. *Magpies* and *Jays* were generally distributed, in woods on the sides of the Gorge. Magpie nests were found in thorn bushes, and a magpie roost was noted in autumn in Wellington farm ground. *Great* and *Blue Tits* were well distributed in all woodland, possibly more plentiful at the western end of the Gorge. *Coal Tits* were less numerous but well distributed. *Wrens* occurred along the whole length of the Gorge; nests were found on ivy-covered rock faces. *Robin* and *Dunnock* were common at suitable spots at all seasons.

Three thrushes: *Blackbird*, *Song Thrush* and *Mistle Thrush* were abundant. The last tended to occupy higher ground than the other two, but the Gorge was filled with the song of all three in the breeding season.

Of four resident *finches* the *Bullfinch* predominated in thick woodland in every area; the *Chaffinch* was equally common, but most abundant at the lower end of the Gorge. *Greenfinch* and *Goldfinch* were generally distributed in scrub, and formed wider ranging flocks or parties in winter.

Other residents were more stricly localised, confined to certain habitats. *Kestrels* were observed in small numbers hunting over the plateau; *Red-legged Partridge* was seen only on the northern plateau where scrub abutted on grassland. *Pheasants* were heard to the north and west where arable adjoined woodland.

Stock Doves are now uncommon. Possibly only a few pairs now nest in the Gorge. The large colony which used to nest opposite the National Trust area was no longer in evidence; only small numbers were seen feeding on arable land. *Green* and *Great Spotted Woodpeckers* were confined to suitable wooded localities.

Skylark, *Meadow Pipit* and *Linnet* were seen only in the grassy plateau area, while the commonest bird in the scrubby north west part was the *Yellow Bunting*. In this part about a pair to the acre was estimated.

Goldcrests were established in three places, all confined to conifers; the *Marsh Tit* was heard and observed in two places only, and the *Long-tailed Tit* was seen during the breeding season in two scrub areas.

House Sparrows were seen only near houses. *Starlings* were comparatively scarce; no large flocks were seen at all. A few pairs may breed in the rock crevices of the Gorge.

The commonest summer migrants were *Willow Warbler*, *Chiffchaff*, *Whitethroat* and *Blackcap*.

Species represented by very small numbers are not all referred to here but are included in the check-list. Certain birds we expected to find during this survey were absent. These were *Whinchat*, *Stonechat*, *Wheatear*, *Cirl Bunting*, *Nightjar* and *Turtle Dove*. (The last named was heard in several of the areas last summer, 1969. C.G.)

During the winter months *Redwings* occurred in small flocks, but few *Fieldfares* were noted, and no large roosts were found.

FINAL CHECK-LIST OF THE BIRDS OF THE CHEDDAR GORGE AREA SURVEY 1965–66.

Symbols used: R=Resident, present all the year, breeding proved or assumed, but not necessarily in the area studied (cf. Rook); S=Summer Visitor, breeding proved or assumed; W=Winter Visitor; F=Seen only in flight; P=Passage Migrant.

Kestrel, R P; Red-legged Partridge, R; Woodcock, W; Curlew, F; Greater B.B. Gull, F; Lesser B.B. Gull, F; Herring Gull, F; Common Gull, F; Black-headed Gull, F; Stock Dove, R; Wood Pigeon, R P; Cuckoo, S; Tawny Owl, R; Swift, S F; Green Woodpecker, R; Great Spotted Woodpecker, R; Skylark, R; Swallow, S F; House Martin, S F; Raven, F; Carrion Crow, R; Rook, R; Jackdaw, R; Magpie, R; Jay, R; Great Tit, R; Blue Tit, R; Coal Tit, R; Marsh Tit, R; Long-tailed Tit, R; Tree Creeper, R; Wren, R; Mistle Thrush, R; Fieldfare, W; Song Thrush, R; Redwing, W; Blackbird, R; Redstart, S; Robin, R; Blackcap, S; Garden Warbler, S; Whitethroat, S; Lesser Whitethroat, S; Willow Warbler, S; Wood Warbler, S; Chiffchaff, S; Goldcrest, R; Spotted Flycatcher, S; Dunnock, R; Meadow Pipit, R P; Tree Pipit, S; Pied Wagtail, R. P; Grey Wagtail, R. P; Starling, R P; Greenfinch, R; Goldfinch, R; Bullfinch, R; Chaffinch, R. P.; Linnet, R; Yellow Bunting, R; Corn Bunting, R; House Sparrow, R;.

LIST OF MEMBERS WHO TOOK PART IN THE CHEDDAR GORGE AREA BIRD SURVEY

Mr. T. R. Cleeves, Miss M. Dennison, Mr. H. Dunnicliff, M.A., Miss C. Graham and Miss V. Graham.

THE BOTANY OF CHEDDAR GORGE

By I. F. Gravestock

The Botanical survey was carried out by Mrs. N. Vaughan Davies, Miss V. Graham, Miss I. F. Gravestock, Mrs. M. J. Rogers and Dr. C. E. D. Smith, and the report compiled by Miss I. F. Gravestock. Thanks are due to Mr. P.J. M. Nethercott for assistance with the field records, in particular for *Sorbus* and *Hieracium* species, and to Capt. R. G. B. Roe. Grateful acknowledgment is also made to Professor A. J. Willis, who kindly read this report and made helpful suggestions and amendments.

The report was divided into four parts: (1) Records from historical sources; (2) Field records of plants found currently; (3) Examination of five quadrats; (4) Notes on the 'Cheddar Rarities'.

1. Records from Historical Sources. These sources were: (1) *The Flora of Bristol* by J. W. White, 1912; (2) *The Flora of Somerset* by Rev. R. P. Murray, 1896; (3) *Supplement to Flora of Somerset* by E. S. Marshall, 1914; (4) *The Proceedings of the Bristol Naturalists' Society*, 1861–1964; (5) S. Challenger: 'Cheddar Pink' in *4th Report Mid-Somerset Naturalists' Society*, 1954, pp. 38–43; (6) Dr. J. T. H. Knight: *Epipactis leptochila*, in Vol. 107, p.121, *Transactions of the Somerset Archaeological and Natural History Society.*

The plants that are specified in the above sources as occurring at Cheddar were distinguished in the report from those, mostly the commoner ones, mentioned as present on Mendip generally. The Cheddar plants are referred to in this summary as 'Cheddar Specialities'. Some are common; nevertheless, White (*Flora*, 1912) in particular evidently did not consider they were 'so abundant and widely distributed as to render' (details of locality) 'unnecessary.' (Explanatory notes on nomenclature, p. 102).

These records are here omitted, except as indicated in section (2) below.

2. Field Records. The area was visited in autumn, 1965, in 1966 and sporadically in later years.

On the advice of Professor A. J. Willis the field records were divided into four parts corresponding to the four main habitats in the Gorge, viz.: (1) Woodland and Scrub; (2) Cliff and Scree; (3) Mill pond and Village; (4) Rough Grassland and Heath. Obviously, the same plant may appear in more than one habitat group.

The full records are not appended, but a selection has been made of the 'Cheddar Specialities' recorded in historical sources and their present-day position compared. Subspecies and varieties, vague and unconfirmed records and those in localities other than the immediate environs of the Gorge have been omitted, and critical species have not, in general, been differentiated. If not found, the habitat column has been left blank.

SELECTED LIST OF 'CHEDDAR SPECIALITIES,' SHOWING CURRENT FIELD POSITION

The nomenclature follows the 'List of British Vascular Plants' by J. E. Dandy, 1958, as revised in *Watsonia*, Vol. 7, Part 3. *Habitat Key:* 1: Woodland and Scrub; (2) Cliff and Scree; (3) Mill-pond and Village; (4) Rough Grassland and Heath.

Name of Species, as shown in historical records	Habitat in which found
Asplenium adiantum-nigrum	1, 2
A. trichomanes	1, 2, 3
Ceterach officinarum	2, 3
Cystopteris fragilis	2
Dryopteris pseudomas	—
Polystichum aculeatum	2
Gymnocarpium robertianum†	1, 2
Ophioglossum vulgatum	1
Taxus baccata	1, 2, 3, 4
Ranunculus penicillatus	3
Aquilegia vulgaris	3, 4
Thalictrum minus†	2, 4
Meconopsis cambrica†	2, 3
Chelidonium majus	1
Diplotaxis muralis	—
Lepidium campestre	—
Coronopus squamatus	—
Cochlearia officinalis†	2
Erophila praecox	—
Arabis hirsuta	2, 4
Viola hirta	1, 2, 3
Polygala vulgaris	4
Hypericum humifusum	—
H. hirsutum	2, 4
H. montanum	2
Helianthemum chamaecistus	2, 4
Dianthus gratianopolitanus†	2, 4
Cerastium arvense	—
*C. diffusum**	—
C. pumilum†	2
C. semidecandrum	2, 4
*Chenopodium bonus-henricus**	—
C. polyspermum	—
C. rubrum	—
Geranium sanguineum†	2
G. columbinum	2, 4
G. robertianum, floribus albis	4
G. purpureum	2
*Erodium maritimum**	

Name	Habitat
E. moschatum	4
Rhamnus catharticus	1
Vitis vinifera	—
Ulex gallii	—
Ononis repens	—
Trifolium hybridum	—
Anthyllis vulneraria	4
Hippocrepis comosa	4
Vicia hirsuta	4
Lathyrus montanus	4
Filipendula vulgaris	4
*Alchemilla filicaulis**	—
*Rosa stylosa**	—
R. micrantha	1
Prunus domestica ssp. domestica	4
Sorbus aria	1, 2
S. aucuparia	1, 2
S. anglica	1, 2
S. porrigentiformis	1, 2
Sedum telephium	2
S. forsteranum†	2, 4
S. reflexum	—
*Saxifraga granulata**	—
S. hypnoides†	1, 4
Chrysosplenium oppositifolium	1
Epilobium roseum	1
E. tetragonum ssp. tetragonum	1
Callitriche platycarpa	—
C. intermedia	—
Torilis nodosa	—
Petroselinum crispum	2, 4
Sison amomum	—
Foeniculum vulgare	1, 3
Pastinaca sativa	1
Polygonum nodosum	—
*Rumex pulcher**	—
Parietaria judaica	2, 3
Juglans regia	2
Betula pubescens	1
Salix purpurea	—
Gentianella amarella	4

Name	Habitat
Menyanthes trifoliata	—
Myosotis hispida	2, 4
Cuscuta epithymum	—
Mentha arvensis	—
Verbascum thapsus	2
V. virgatum	—
Linaria vulgaris	1
*Chaenorhinum minus**	—
Veronica anagallis-aquatica	—
Euphrasia nemorosa	4
Lathraea squamaria	—
Orobanche hederae	2
Verbena officinalis	4
Origanum vulgare	1, 2, 3, 4
Thymus pulegioides	—
Calamintha ascendens	1, 4
Acinos arvensis	4
Melissa officinalis	4
Prunella laciniata†	4
P. laciniata x vulgaris	4
Stachys officinalis	2, 4
Leonurus cardiaca	—
Campanula trachelium	1, 4
*C. glomerata**	—
C. rotundifolia	2, 4
Cruciata laevipes	1, 4
Galium pumilum	2, 4
Viburnum opulus	1
Valerianella eriocarpa	—
Valeriana officinalis	1, 2
Centranthus ruber	2, 3
Scabiosa columbaria	1, 2, 4
Inula conyza	3, 4
Filago vulgaris	—
Antennaria dioica	4
Solidago virgaurea	1, 2, 4
Artemisia vulgaris	—
Carlina vulgaris	2, 4
Carduus nutans	1, 2, 4
C. acanthoides	2, 4
Cirsium acaule	2, 4
Picris hieracioides	4
Mycelis muralis	1, 2, 3
Hieracium maculatum	2
H. lachenalii	2
H. schmidtii	2
H. stenolepiforme	2
H. cyathis	2
H. angustisquamum	2
Crepis taraxacifolia	2, 4
Polygonatum odoratum	—
Luzula multiflora	4
Cephalanthera damasonium	—
Epipactis helleborine	1
E. leptochila	—
Spiranthes spiralis	4
Coeloglossum viride	—
*Gymnadenia conopsea**	—
Ophrys apifera	4
Dactylorhiza maculata ssp. ericetorum	4
Anacamptis pyramidalis	1
Carex acutiformis	—
C. flacca	4
C. caryophyllea	2, 4
C. acuta	—
C. vulpina x remota	—
C. pulicaris	1
C. nigra	2, 4
Sieglingia decumbens	4
Glyceria plicata	—
Festuca pratensis	4
F. gigantea	—
Vulpia bromoides	—
Poa nemoralis	1, 2
P. compressa	—
Bromus erectus	2
B. ramosus	—
B. racemosus	—
Koeleria cristata	2
Avena fatua	—
Helictotrichon pratense	2, 4
H. pubescens	4
Aira praecox	4
Calamagrostis epigejos	—

* Old Record (probably before 1896).
† 'Rarity'—see section 4.

3. QUADRATS. Five quadrats were examined by Miss V. Graham. These comprised: (1) Hazel copse, light shade; (2) Ditto, shade; (3) Damp pasture on steep slope; (4) South-facing scree; (5) North-facing scree. All except (3), which was 5 × 5m., were 10 × 10m. The difference in vegetation and number of species is of interest—e.g. 28 spp. in (4) compared with 8 in (2).

4. CHEDDAR RARITIES. Ten plants found at Cheddar are either very rare, or especially noteworthy in their location. A confidential

report was made on these, showing location and present condition. Most are limestone rock or grassland species. They are:—*Gymnocarpium robertianum: Thalictrum minus: Meconopsis cambrica* (native in damp shady rocky places in hill districts of S.W. England and Wales, introduced or garden escape elsewhere): *Cochlearia officinalis* (a salt-marsh and sea-cliff species that is rather rare inland): *Geranium sanguineum: Dianthus gratianopolitanus* (Clapham, Tutin & Warburg, *Flora of the British Isles*, 1962—'Confined to Carboniferous Limestone cliffs at Cheddar Gorge.' Rarely naturalized nearby): *Cerastium pumilum: Sedum forsteranum: Saxifraga hypnoides* (its most southerly distribution is at Cheddar): *Prunella laciniata* (found with the hybrid *Prunella laciniata* × *vulgaris*, which is the less rare).

COMMENTS. The number of species found was about 362. The table in section (2) shows that, of 165 'specialities,' 59 were not found. Of these, 10 were records probably prior to 1896. Six are water or marsh plants probably located south of the area. Others depended on being pin-pointed and the observers were not lucky.

The fact that a species was not found does not, of course, mean that it was not there. Field observations in the Gorge are difficult owing to the impracticability nowadays of paths on the north side. In addition, some extremely inclement weather hampered work especially in the village. All in all, there were probably about 40–43 species of those previously recorded that might have been found. There were, however, discovered 40 plants that were not given in the historical sources. Of these, 9 are not shown in these at all; the remaining 31 are noted by sources (White) as at a specified location, but not at Cheddar.

It would, therefore, appear that the loss of the less common plants is smaller than might have been feared. Active measures are being taken by the Somerset Trust to conserve the rarities.

Interesting sightings included:—

Genista hispanica of uncharacteristic form near the reservoir; a lilac *Raphanus raphanistrum* with one-seeded pods in the village; white-flowered *Centaurium erythraea* on high grassland; a new location at the top of the Gorge for *Dianthus gratianopolitanus* (found by Mr. C. H. Cummins); some showy aliens in the village and lower screes: *Berberis vulgaris*, *Cheiranthus cheiri*, *Cerastium tomentosum*, *Geranium endressii*, *Lathyrus latifolius*, *Crocosmia crocosmiflora*. Other finds were: A large patch of *Saxifraga tridactylites* on level ground at the scree-top, with creamy, robust flowers; *Quercus cerris* and a few bushes of *Rosa pimpinellifolia*, also on the high cliffs; *Polygonatum multiflorum* and *Convallaria majalis; Vaccinium myrtillus* apparently on calcareous soil; and the rare *Sorbus anglica* and *S. porrigentiformis* were confirmed as still present, as was *Hieracium stenolepiforme*, whose sole location is at Cheddar. Surprisingly, some of the commoner plants were not found, viz., *Anthriscus sylvestris*, *Sagina procumbens*, *Geranium dissectum*, *Lathyrus pratensis* and *Knautia arvensis*.

MAMMALS

By F. H. Rawlings

Because of the skulking or nocturnal habits of mammals it is difficult to make a comprehensive field survey. A team with an adequate trapping programme is necessary. Now that the Mammal Section of the B.N.S. has undertaken work of this kind it should be possible to obtain a more detailed and comprehensive mammal survey of the Gorge at a later date.

(a) MAMMALS OBSERVED OR DEDUCED FROM DIRECT EVIDENCE

Order INSECTIVORA	Hedgehog	*Erinaceus europaeus*
	Mole	*Talpa europaea*
	Common Shrew	*Sorex araneus*
	Pygmy Shrew	*Sorex minutus*
Order CHIROPTERA	Greater Horseshoe Bat	*Rhinolophus ferrumequinum*
	Lesser Horseshoe Bat	*Rhinolophus hipposideros*
Order LAGOMORPHA	Rabbit	*Oryctolagus cuniculus*
	Brown Hare	*Lepus europaeus*
Order RODENTIA	Grey Squirrel	*Sciurus carolinensis*
	Bank Vole	*Clethrionomys glareolus*
	Field Vole	*Microtus agrestis*
	Wood Mouse	*Apodemus sylvaticus*
Order CARNIVORA	Fox	*Vulpes vulpes*
	Badger	*Meles meles*

(b) MAMMALS RECORDED IN THE B.N.S. PROCEEDINGS 1940, p. 115.

Order INSECTIVORA	Water Shrew	*Neomys fodiens*
Order CARNIVORA	Polecat	*Mustela putorius*
	(Killed in the Gorge 1928)	
	Otter	*Lutra lutra*
	(The spotted form 1935)	

The following are so common in North Somerset as to occur almost certainly within the survey area:

Order Rodentia	Water Vole	*Arvicola amphibius*
	House Mouse	*Mus musculus*
	Dormouse	*Muscardinus avellanarius*
Order Carnivora	Stoat	*Mustela erminea*
	Weasel	*Mustela nivalis*

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THE PORTLANDIAN AND PURBECKIAN OF THE VALE OF WARDOUR

By A. Insole and C. A. Wright

(Department of Geology, University of Bristol)

INTRODUCTION

Upper Jurassic rocks are exposed in the core of an eroded anticline centred on the Vale of Wardour, situated ten miles west of Salisbury, Wiltshire. The main outcrop of the Portland Beds occupies a dissected plateau surrounding the town of Tisbury. The Purbeckian rocks are exposed to the east of Tisbury where the easterly plunge of the anticline facilitates the exposure of the younger beds.

In the past, a number of quarries were exploited for the building stone, providing exposures which made this a classic geological area. Sowerby (1818) published the first measured section of the Portlandian at Chicksgrove but this was overgrown by the time Andrews and Jukes-Browne (1894) and Woodward (1895) produced their detailed work on the Portland and Purbeck beds. Jukes-Browne (1903) published a criticism of Woodward's work in which he questioned the position of boundaries within the Purbeck beds. A summary of the Vale of Wardour stratigraphy was produced by Arkell (1933) while House (1954) published a discussion of the Portlandian zone fossils from the Vale of Wardour. In this, the following correlation of the stratigraphy was produced:—

Zones	Isle of Portland	Vale of Wardour
Titanites titan	Freestone Series	? Upper Building Stones
Kerberites okusensis	Cherty Series Basal Shell Bed	Chalky Series Ragstone Beds
Glaucolithites gorei	Portland Clay West Weare Sandstones Exogyra Bed	Lower Building Stones
Zaraiskites albani	Blacknore Series	Basement Beds

In the present study, the section at each locality has been measured and the major beds have been sampled. All the limestones

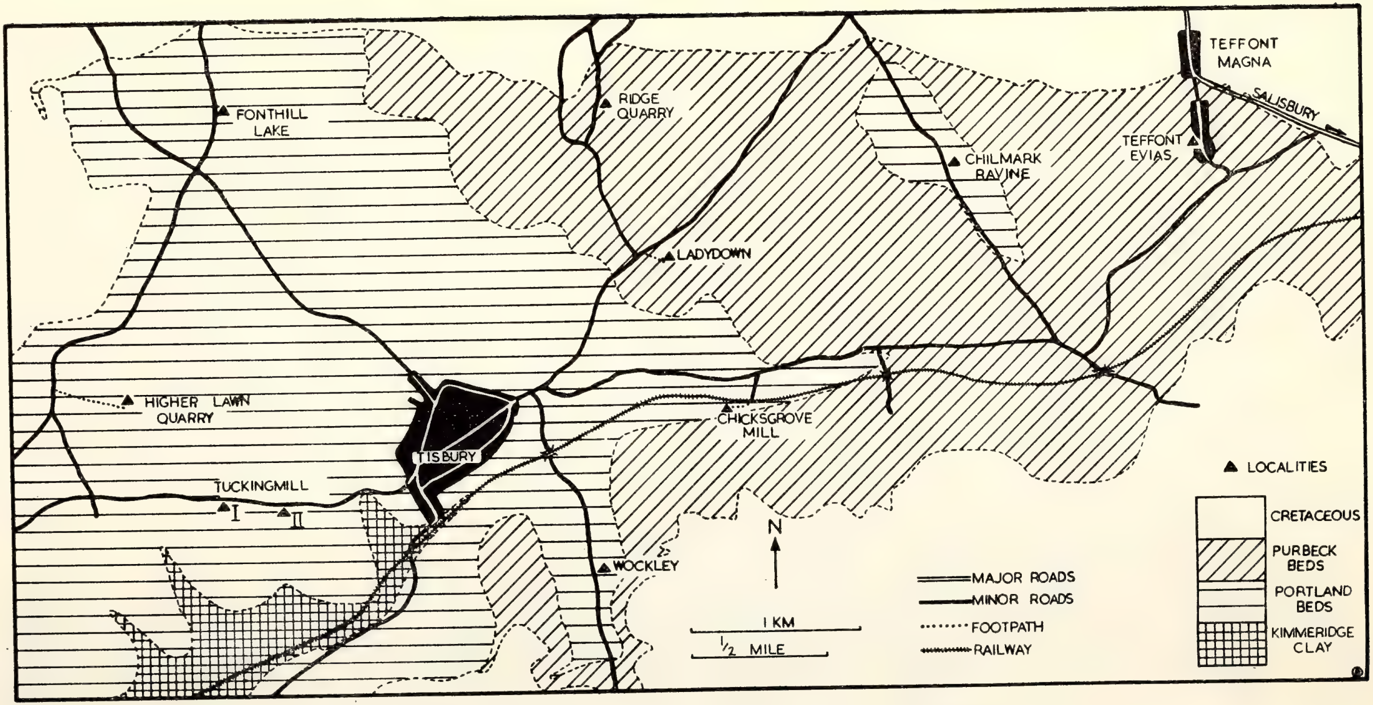

FONTHILL LAKE
RIDGE QUARRY
LADYDOWN
CHILMARK RAVINE
TEFFONT MAGNA
SALISBURY
TEFFONT EVIAS
HIGHER LAWN QUARRY
TISBURY
CHICKSGROVE MILL
TUCKINGMILL
I
II
WOCKLEY
N
1 KM
1/2 MILE
MAJOR ROADS
MINOR ROADS
FOOTPATH
RAILWAY
LOCALITIES
CRETACEOUS
PURBECK BEDS
PORTLAND BEDS
KIMMERIDGE CLAY

Fig. 1. Sketch map showing location of quarries in the Vale of Wardour.

have been described according to the classification of Folk (1959, 1962), Cowie (1969). Peels were produced by the method outlined by Murray (1969).

The location of the following quarries is shown on the map, Figure 1, the geology being taken from Andrews and Jukes-Browne (1894).

DESCRIPTION OF SECTIONS

Upper Tuckingmill Quarry (1) (ST/931292) and Lower Tuckingmill Quarry (2) (ST/933291).

The sections expose 14 and 15 feet respectively of Lower Building Stone. This is a quartz sand with a calcareous cement with thin lenses of grey laminated chert. The chert lenses appear to be early diagenetic, replacing the bedding structures. Fossil preservation is at its best in the chert bands, bivalves being found with the original shell material replaced by chert. One mould of *Glaucolithites* was seen while moulds of *Laevitrigonia gibbosa* (J. Sowerby) and *Protocardia dissimilis* (J. de C. Sowerby) were collected.

Fonthill Lake (ST/934315)

13 feet of Lower Building Stones are exposed in the following succession:—

Quartz sand with calcareous cement (decalcified in patches) with some chert nodules. Locally there is a development of a roach-like bed interbedded with the sandstones. Abundant examples of *Laevitrigonia gibbosa* (J. Sowerby). This bed is seen to 6 feet 4 inches.

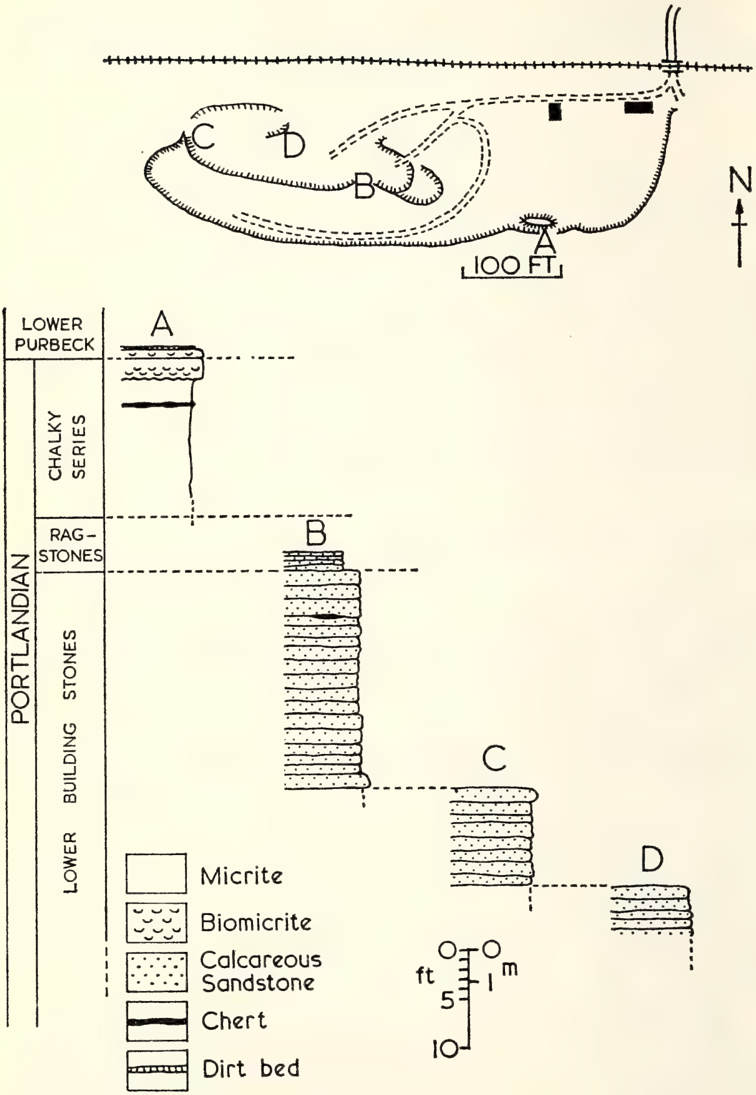
Prominent black chert .. .. .. 10 inches.

Decalcified quartz sand with calcareous cement forming three massive beds. Abundant *Laevitrigonia gibbosa* (J. Sowerby) are present. One specimen of *Glaucolithites* was seen though it was not *in situ* .. 5 feet 10 inches.

Chicksgrove Mill Quarry (ST/963297)

Exposures comprise 60 feet of Portland and Lower Purbeck rocks, which may be studied in four separate sections within the quarry. The sections and their locations are given in Figure 2. This quarry was reopened in 1968 and provides the best outcrop of Portland Stone in the area.

The section is described from the top of the succession downwards. Section A is situated in the disused south eastern corner of the quarry and is divided into the Lower Purbeck and Chalky Series. The Lower Purbeck is capped by 6 feet of rubble resting on a black to dark brown clay, 3 inches thick, which resembles the dirt beds of the Purbeck on the Dorset coast. Below this is a biomicrite with miliolid foraminifera and ostracods. The biomicrite exhibits local


C
D
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100 FT
N
LOWER PURBECK
PORTLANDIAN
CHALKY SERIES
RAG-STONES
LOWER BUILDING STONES
A
B
C
D
Micrite
Biomicrite
Calcareous Sandstone
Chert
Dirt bed
ft
0
5
10
0
1
m

Fig. 2. Plan and section of Chicksgrove Mill Quarry.

coarsening to a biomicrosparite and passes down to a thinly bedded laminated micrite, the total thickness being ten inches. The fauna includes abundant ostracods which are seen clustered on bedding plane surfaces. Plant remains are also present. Fish bones and numerous detached scales are common, being derived from *Lepidotus* cf. *minor* Agassiz and *Ophiopsis breviceps* Egerton.

The Upper Building Stones are absent from this locality and are thought to be present only in the Chilmark Ravine (House 1958). Therefore, the Portlandian, represented by the Chalky Series, commences with a massive bed of micrite, 2 feet thick, with scattered shell fragments and very fine detrital grains. The upper part is unfossiliferous but the basal 1 foot is a rich shell bed with abundant moulds of *Laevitrigonia gibbosa* (J. Sowerby), *Camptonectes lamellosus* (J. Sowerby), *Protocardia dissimilis* (J. de C. Sowerby) and *Ostrea expansa* (J. Sowerby). The section is completed by 3 inches of black chert followed by unfossiliferous pale grey, soft micrite which is seen to 9 feet.

The base of the Chalky Series and the top of the Ragstone Beds are not at present visible. However, in the floor of the quarry, blocks of biomicrite similar to the Chalky Series were studied. It seems likely that these blocks come from the 'Spangle Bed' (Sowerby 1818) at the base of the Chalky Series.

The Lower Building Stones may be studied in the main part of the quarry at sections B, C and D. (Fig. II). They are capped by 2 feet of irregularly bedded quartz sand with a calcareous cement, equivalent to the Ragstone Beds. The rest of the Building Stones consists of 36 feet 6 inches of yellow to olive green sand with a calcareous cement which is extremely variable in lithology both vertically and laterally. The glauconite contribution increases downwards and the beds also become sandier, presumably as the boundary with the Basement Beds is approached. Impressions of interference ripple marks are visible on the lower surface of a bed, 16 feet below the upper boundary. Chert lenses which preserve the cross bedding are present in the upper part of the succession. As stated before, bivalve preservation is at its best in the cherty lenses.

The most spectacular contribution to the fauna is the presence of large specimens of the ammonite *Glaucolithites*. Most specimens are about nine inches in diameter but larger forms were visible in the rock face. Their preservation varies, some examples being squashed while others exhibit a perfect form. The larger ammonites are often encrusted with an epifauna of serpulid worms and oysters. Also present are abundant moulds of *Laevitrigonia gibbosa* (J. Sowerby). Some examples were found with their hinges still joined, indicating little reworking after burial.

Ladydown Quarry (ST/961307)

The quarry provides the only exposure of Middle Purbeck in the area.

11.	Marls with a discontinuous thin white marly mudstone band about three inches above the base. This is probably the *Archeoniscus* bed of Jukes-Browne (1894)	6 ins.
10.	Brown quartz sand with a calcareous cement	6 ins.
9.	Very finely laminated alternations of shelly and sandy micrite, possibly dolomitised	9 ins.
8.	Impure biomicrite with scattered ooliths, shell fragments and rare pellets. Dark algal coating to shells	7 ins.
7.	Cream coloured microsparite with scattered ooliths passing down into bed 6 the boundary being irregular and marked by a dark lamination, possibly algal in origin	9 ins.
6.	Impure biomicrite with scattered ooliths, shell fragments and rare pellets. Algal coating to shells	5 ins.
5.	Marl	3 ins.
4.	Laminated cream and brown marls	1½ ins.
3.	Beef bed, fibrous calcite in a single irregular bed	1–2 ins.
2.	Laminated orange and brown marls resting on an irregular surface. Scattered *Ostrea distorta* (J. Sowerby)	1 in.
1.	Grey dolomitised micrite with rare shells	seen to 1 ft. 3 ins.

Bed 1 was described by Andrews and Jukes Browne (1894) as a Cinder Bed but the shells are very scattered and it bears very little similarity to the Cinder Bed seen on the Isle of Purbeck. The succession as a whole indicates a very shallow water accumulation with many examples of algal growth. Many of the ooliths in beds 6 and 8 exhibit several stages of growth. The ooliths have developed and then been eroded and weathered before resubmergence and continued growth. As a result, they exhibit aberrant laminar growth patterns. Dolomitization is irregular and often difficult to distinguish from the recrystallised texture.

SUMMARY

Many type sections described by Andrews and Jukes Browne (1894) and Woodward (1895) are now either partially or totally obscured. These include the following localities:—

Higher Lawn Quarry	Overgrown.
Ridge Quarry	Mostly overgrown.
Wockley	Obscured in the main although part of the Chalky Scenes still visible.
Teffont Evias	Obscured.
Chilmark	R.A.F. property.

The new section at Chicksgrove provides an excellent opportunity to study the Portlandian and Purbeckian rocks and collect large ammonites.

The sections are of interest because of their position in relation to the Wessex Basin during upper Jurassic times. The Portlandian rocks, though near the basin margin, were not removed from currents because the large number and possible variety of ammonites indicates a continuous source for the fauna. The Chalky Series represent a supply of carbonate mud into shallow water, but the methods of deposition are not evident from the rock. Howitt (1964) produced an isopachyte map of the total Purbeck succession (Fig. 7a, page 96) and from this one can see that the Vale of Wardour is situated on the western margin of the basin. This would suggest an accumulation of shallow water deposits and the sections given above indicate this regime. The presence of *Ostrea distorta* indicates brackish water conditions and the variable lithologies are also of a shallow water type. Therefore the region as a whole is of interest for studying marginal marine deposits removed from the major sites of Upper Jurassic sedimentation.

ACKNOWLEDGMENTS

The authors would like to thank Dr. J. W. Murray for reading the manuscript and making many useful suggestions.

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ERRATA

In Murray, J. W. 1969. Reference above:—

p. 536, line 4 . . . ferricyanide.

p. 542, fig. 4 . . . this figure has been printed 12% smaller than indicated by the reference scale on figure 2.

NOTES ON THE SEVERN BORE

By D. H. Peregrine
Department of Mathematics, University of Bristol

A BORE forms in the Severn estuary on each spring tide. Spring tides have a tidal range greater than average and recur every fortnight. There is then a bore twice a day. However, spring tides vary in height and are usually particularly high for a short period once every four weeks in spring and autumn; e.g. in autumn 1970 there will be high spring tides on 17–21st August, 15th–19th September and 14th–17th October. The size of the bore may be estimated by looking up the predicted height of the tide at Avonmouth. This is tabulated in many places, e.g. Whitaker's Almanac. A tide of 40′ or more will give a bore. Large bores are formed by tides over 44′. Winds in the British Channel and floods in the River Severn can affect the height of a bore quite considerably.

Bores start just above Sharpness and take about 2½ hours to travel up to Gloucester. With a car it is not difficult to see one bore at several places.

The time of arrival of the bore may be estimated by adding the following times to the predicted time of high tide at Avonmouth.

Hock	— 40 mins.	Minsterworth	+ 45 mins.
Newnham	— 15 mins.	Stonebench	+ 60 mins.
Framilode	+ 20 mins.	Lower Parting	+ 80 mins.

The actual time of arrival of the bore can vary from the estimated time by up to 10 minutes earlier and as much as 30 mins. later. It travels faster if there are strong S.W. winds in the Bristol Channel, and it may travel faster if the river is in flood. A small bore travels more slowly. Bores always occur between 6.00 and 12.00 a.m. or p.m. so that an evening bore is only in daylight during the summer, and the largest bores can only be seen in the morning.

The most popular places for seeing the bore are Newnham, Framilode, Epney, Minsterworth and Stonebench. The best places and its rate of progress vary due to shifting sandbanks and shoals.

The bore and river change in character just above Epney. Below Epney the river is wide and shallow, and the bore often breaks across its whole front. Above Epney the river is narrower and deeper and the bore is usually smooth with some breaking near the banks.

"The Severn Bore" by F. W. Rowbotham, (David & Charles, 1964). and 1″ Ordinance Survey sheets 143, and 156 are useful.

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